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1991

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MODEL **HP-1144 AC Power Supply**

# **HEATHKIT®**

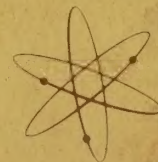
## **ASSEMBLY MANUAL**

Model HP-1144 AC Power Supply

HEATH COMPANY • BENTON HARBOR, MICHIGAN



PRICE \$2.00



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595-1599-01



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The following telephone numbers are direct lines to the departments listed:

Kit orders and delivery information ..... (616) 982-3411  
Credit ..... (616) 982-3561  
Replacement Parts ..... (616) 982-3571

*Technical Assistance:*

R/C, Audio, and Electronic Organs ..... (616) 982-3310  
Amateur Radio ..... (616) 982-3296  
Test Equipment, Strobe Lights, Calculators,  
Clocks, Weather Instruments ..... (616) 982-3315  
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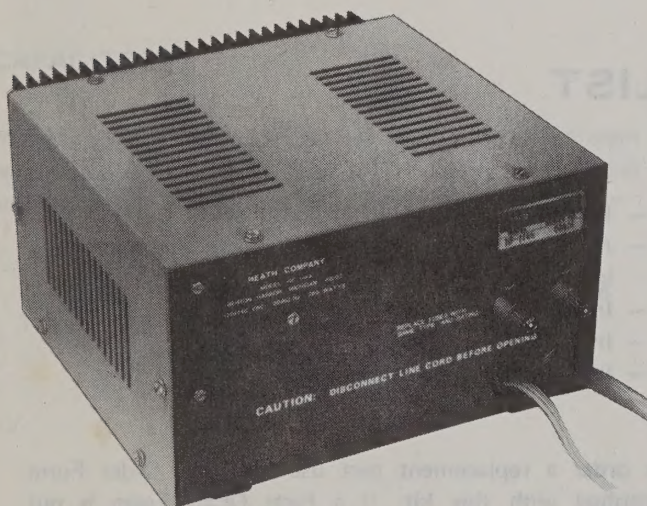


# Assembly and Operation of the



## AC POWER SUPPLY

MODEL HP-1144



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HEATH COMPANY  
BENTON HARBOR, MICHIGAN 49022



## INTRODUCTION

The Heathkit Model HP-1144 AC Power Supply provides well-regulated, low voltage, DC power from an AC power source. You can wire it to operate from either a 120-volt AC or 240-volt AC 50/60 Hz power line and maintain regulation within 2%.

This AC Power Supply was primarily designed to provide +13.8 VDC for the Heathkit, Model SB-104 SSB Transceiver. A cable and socket provide output power and a series connection for the remote on-off switch on the Transceiver.

The attractive, rugged construction and reliable performance of this Power Supply will provide many years of dependable service.

Refer to the "Kit Builders Guide" for complete information on unpacking, parts identification, tools, wiring, soldering, and step-by-step assembly procedures.

## PARTS LIST

Check each part against the following list. The parts may vary slightly from the illustration. Keep any part that is individually packaged with a part number on it in its package after you identify it until you actually use it. Some parts are marked with a "171-" packaging number. These numbers are used for packaging only and do not appear in the Manual "Parts List." Save all packaging material until you locate all the parts.

Each circuit part in this kit has its own circuit component number (R2, C4, etc.). Use these numbers when you want to positively identify the same part in the various sections of the Manual. These numbers, which are especially useful when a part has to be replaced, appear:

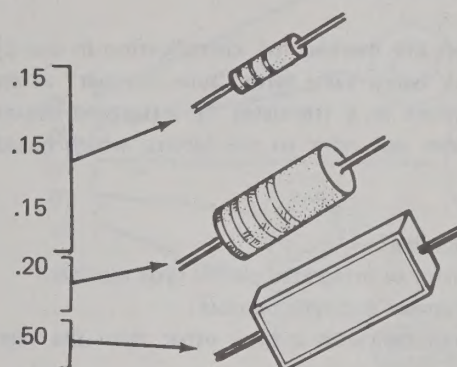
- In the Parts List,
- At the beginning of each step where a component is installed,
- In some illustrations,
- In the Schematic,
- In the sections at the rear of the Manual.

To order a replacement part use the Parts Order Form furnished with this kit. If a Parts Order Form is not available, refer to "Replacement Parts" inside the rear cover of this Manual. NOTE: Never use a "171-" packaging number if you must order replacement parts; use only the part numbers listed in the following list.

QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.	PRICE Each
------	-------------	-------------	--------------------------	---------------

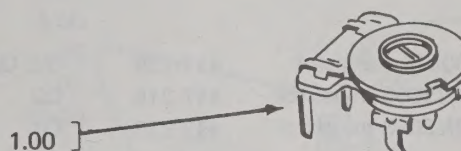
# RESISTORS

( )	1	22 $\Omega$ (red-red-black), 1/2-watt	1-49	R1	.15
( )	1	820 $\Omega$ (gray-red-brown), 1/2-watt	1-8	R7	.15
( )	1	2200 $\Omega$ (red-red-red), 1/2-watt	1-44	R5	.15
( )	1	270 $\Omega$ (red-violet-brown), 2-watt	1-30-2	R4	.20
( )	8	.33 $\Omega$ , 5-watt	3-11-5	R2, R3 (4 each)	.50



# CONTROL

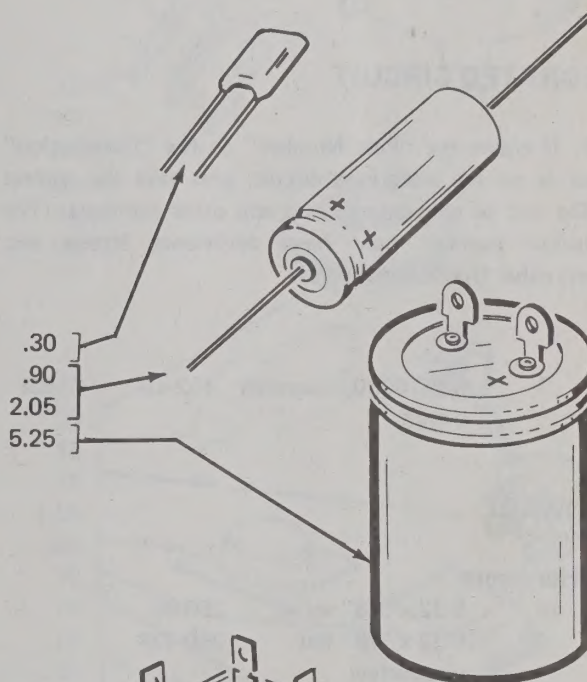
( )	1	500 $\Omega$	10-381	R6	1.00
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# CAPACITORS

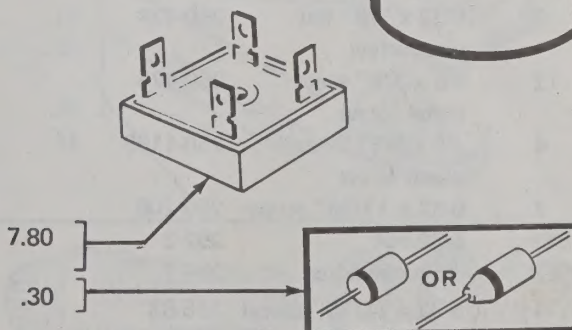
NOTE: Mylar capacitors can be marked three different ways. EXAMPLE: .1, .1k, or .1  $\mu$ F. However, the parts list and installation instructions will always use  $\mu$ F.

( )	2	.1 $\mu$ F Mylar*	27-47	C4, C6	.30
( )	1	500 $\mu$ F electrolytic	25-199	C5	.90
( )	1	2500 $\mu$ F electrolytic	25-154	C3	2.05
( )	2	10,000 $\mu$ F electrolytic	25-263	C1, C2	5.25



# DIODES-TRANSISTORS

( )	1	MDA990-2 bridge rectifier	57-88	BR1	7.80
( )	1	1N4002 diode	57-65	D5	.30



\*DuPont Registered Trademark



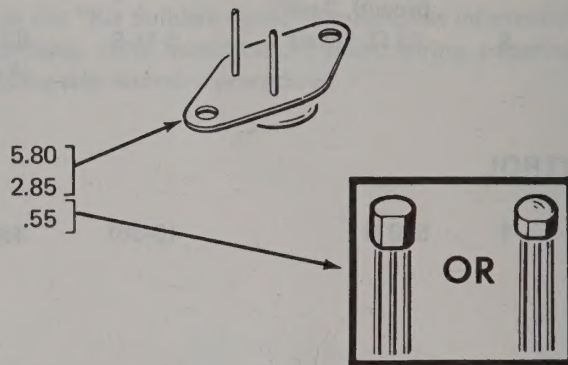
QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.	PRICE Each
------	-------------	-------------	--------------------------	---------------

### Diodes-Transistors (cont'd.)

NOTE: Transistors are marked for identification in one of the following four ways. (The term "type number" refers only to the numbers in a transistor or integrated circuit description. It does not refer to the letters, which could change.)

1. Part number.
2. Transistor or integrated circuit type number.
3. Part number and type number.
4. Part number with a type other than the one listed.

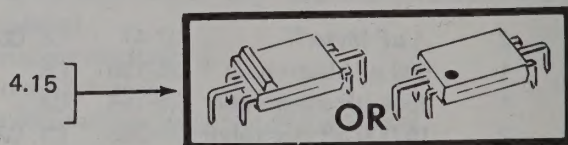
( )	2	40411 transistor	417-139	Q3, Q4
( )	1	2N3055 transistor	417-215	Q2
( )	1	2N3643 transistor	417-233	Q1



### INTEGRATED CIRCUIT

NOTE: If either the "Part Number" or the "Description" number is on the integrated circuit, you have the correct part. Do not be concerned about any other numbers. (The Description number may have additional letters and numbers other than those given.)

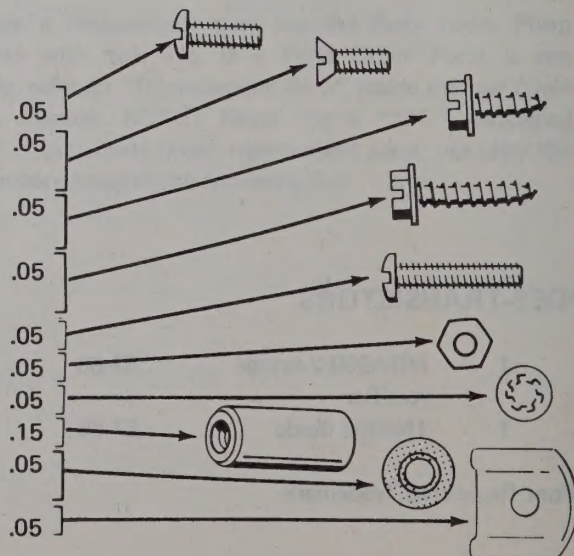
( )	1	MFC 6030 integrated circuit	442-48	IC1
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### HARDWARE

#### #6 Hardware

( )	16	6-32 x 3/8" screw	250-89
( )	2	6-32 x 3/8" flat head screw	250-434
( )	12	#6 x 3/8" sheet metal screw	250-475
( )	4	#6 x 5/8" sheet metal screw	250-1199
( )	7	6-32 x 11/16" screw	250-206
( )	13	6-32 nut	252-3
( )	22	#6 lockwasher	254-1
( )	4	6-32 x 11/16" spacer	255-83
( )	6	#6 fiber shoulder washer	253-2
( )	1	#6 D washer	253-89



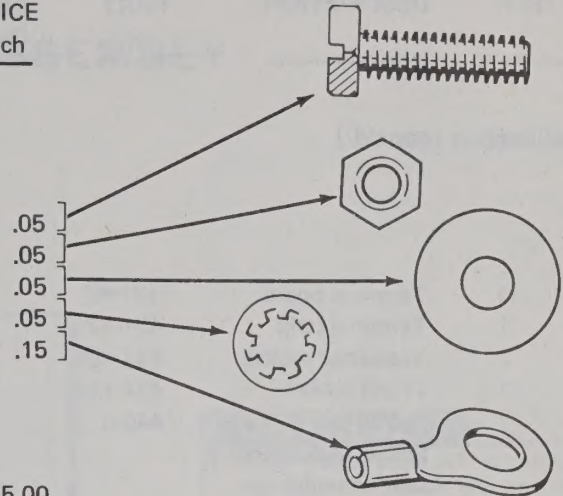


QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.	PRICE Each
------	-------------	-------------	--------------------------	---------------

### Hardware (cont'd.)

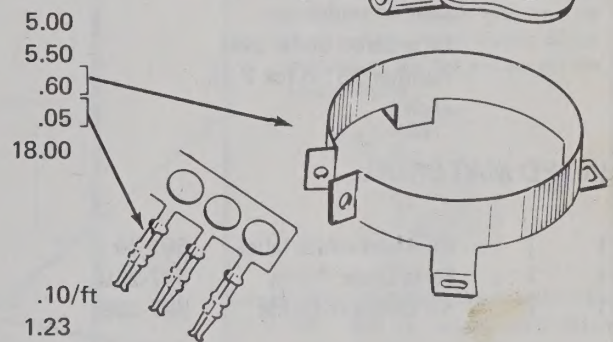
#### 1/4" Hardware

( )	8	1/4"-20 x 7/8" screw	250-253	
( )	13	1/4" nut	252-57	
( )	9	1/4" flat washer	253-31	
( )	14	1/4" lockwasher	254-14	
( )	1	Large solder lug	259-23	



### METAL PARTS

( )	1	Cover	90-1108-1	5.00
( )	1	Chassis	200-678-1	5.50
( )	2	Clamp	207-2	.60
( )	1	Connector pin	259-20	.05
( )	1	Heat sink	215-76	18.00



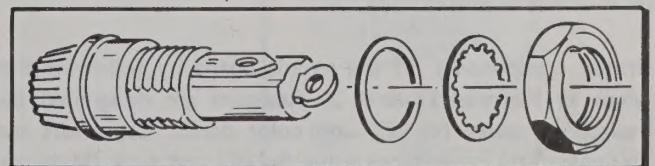
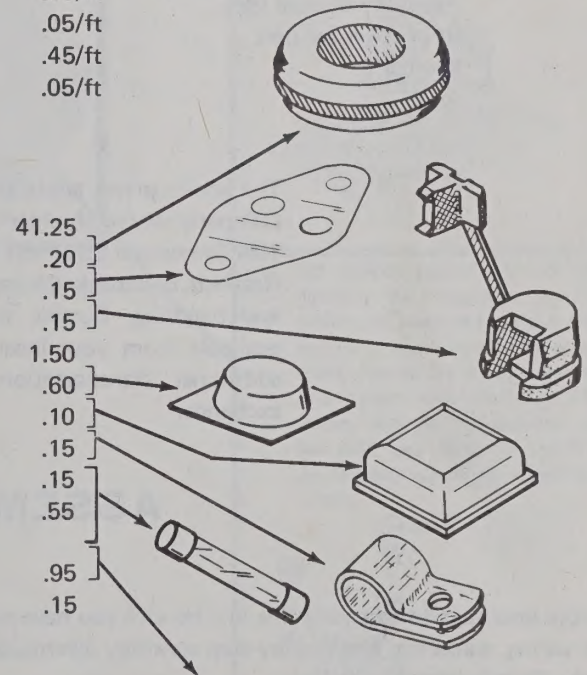
### WIRE-SLEEVE

( )	1	Large sleeving	346-4	
( )	1	Line cord	89-23	
( )	1	Brown wire #18	344-31	
( )	1	Small sleeving	346-7	
( )	1	Cable (9 wire)	347-40	
( )	1	Bare wire	340-1	

.10/ft  
1.23  
.05/ft  
.05/ft  
.45/ft  
.05/ft

### MISCELLANEOUS

( )	1	Transformer	54-848	T1	41.25
( )	1	Grommet	73-23		.20
( )	2	Mica insulator	75-44		.15
( )	1	Strain relief	75-71		.15
( )	1	Printed circuit board	85-1392-1		1.50
( )	1	Thermal grease	352-31		.60
( )	4	Plastic foot	261-34		.10
( )	1	Cable clamp	207-18		.15
( )	1	20-amp fuse, 3AG, SFE	421-18	F2	.15
( )	1	7-amp fuse, 3AG, MDX7 slow-blow	421-9	F1	.55
( )	2	Fuseholder	423-1		.95
( )	1	Nut starter	490-5		.15





QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.	PRICE Each
------	-------------	-------------	--------------------------	---------------

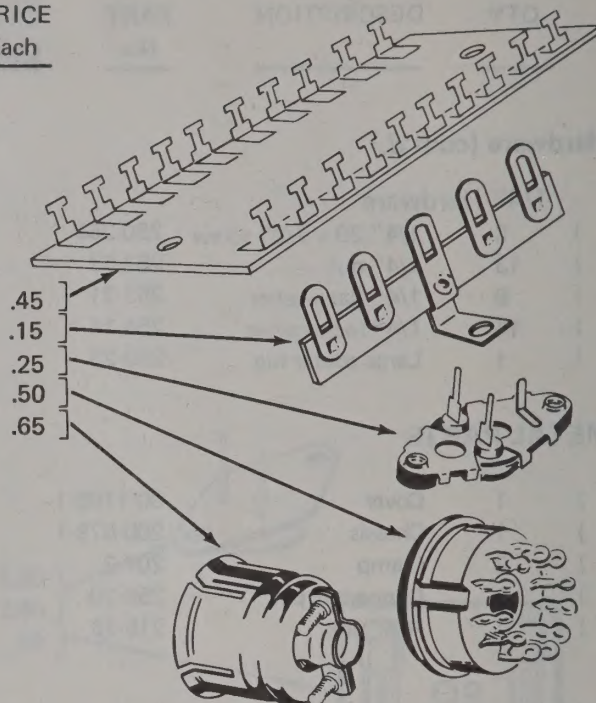
## Miscellaneous (cont'd.)

( )	1	Terminal board	431-67	
( )	1	Terminal strip	431-42	
( )	2	Transistor socket	434-189	
( )	1	11-pin socket	434-118	
( )	1	Socket cap	440-8	
( )		Solder (Additional 3' rolls of solder can be ordered under part number 331-6 for \$.25 each.)		

## PRINTED MATERIAL

( )	1	Blue and white label	391-34	
( )	1	Parts Order Form	597-260	
( )	1	Kit Builders Guide	597-308	

Assembly Manual (See front cover for part number.)



The above prices apply only on purchases from the Heath Company where shipment is to a U.S.A. destination. Add 10% (minimum 25 cents) to the price when ordering from a Heathkit Electronic Center to cover local sales tax, postage, and handling. Outside the U.S.A., parts and service are available from your local Heathkit source and will reflect additional transportation, taxes, duties, and rates of exchange.

## ASSEMBLY NOTES

Before you start to assemble this kit, be sure you have read the wiring, soldering, and step-by-step assembly information in the "Kit Builders Guide."

Install components on the circuit board by following the steps in Pictorials 1 and 2. Resistors are designated by resistance values (in  $k\Omega$ ) and color bands. Capacitors are designated by capacitance value (in  $\mu F$ ) and type (Mylar or

electrolytic). Read the entire step before you perform the operation; then follow the instructions carefully. Position all parts as shown in the Pictorials.

**SAFETY WARNING:** Avoid eye injury when you clip off excess leads. We suggest you wear glasses or at least clip the leads so the ends will not fly toward your eyes.



# STEP-BY-STEP ASSEMBLY

## CIRCUIT BOARD ASSEMBLY

Locate the circuit board and position it lettered side up as shown in Pictorial 1. Then complete each step in the Pictorials.

### START

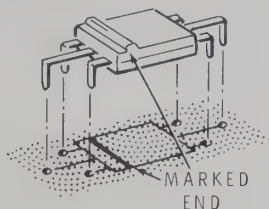
( ) R1: 22  $\Omega$  (red-red-black).

( ) R5: 2200  $\Omega$  (red-red-red).

**FOR GOOD SOLDER CONNECTIONS, YOU MUST KEEP THE SOLDERING IRON TIP CLEAN.**

WIPE IT OFTEN WITH A DAMP SPONGE OR CLOTH.

NOTE: In the following step you will install the integrated circuit. First position the marked end of the integrated circuit over the marked end of the circuit board. Then insert the leads into their respective holes and solder them to the foil.



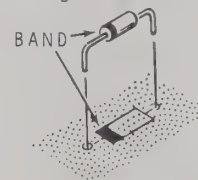
( ) IC1: MFC6030 integrated circuit (#442-48).

( ) R7: 820  $\Omega$  (gray-red-brown).

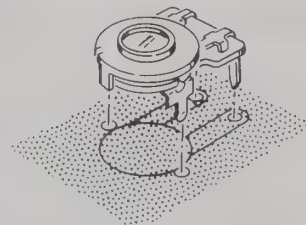
( ) Solder all leads to the foil and cut off the excess lead lengths.

### CONTINUE

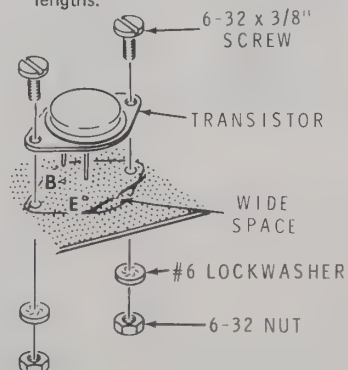
( ) D5: 1N4002 diode (#57-65). Match the band on the diode with the band mark on the circuit board. Solder the leads to the foil and cut off the excess lengths.



( ) R6: 500  $\Omega$  control (#10-381). Solder the four pins to the foil.



( ) Q2: 2N3055 transistor (#417-215). Position the transistor over its outline and insert the E and B leads into the E and B holes in the circuit board. Mount the transistor to the circuit board with two 6-32 x 3/8" screws, two #6 lockwashers, and two 6-32 nuts. Solder the leads to the foil and cut off the excess lead lengths.

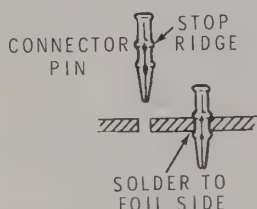


PICTORIAL 1

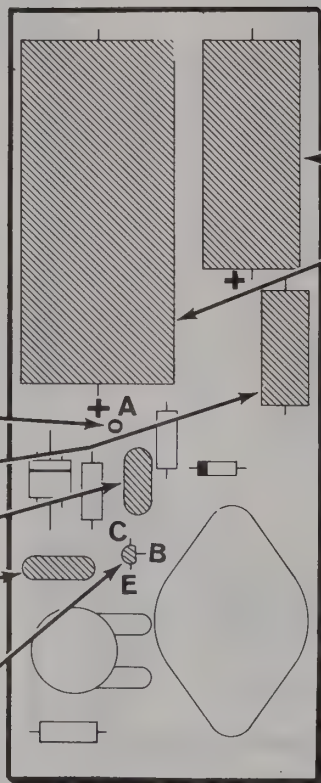
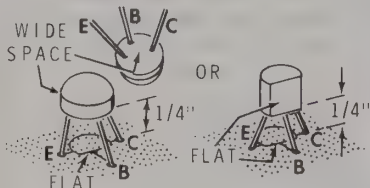


**START** ➡

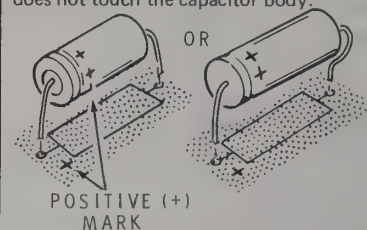
NOTE: In the following step, install a connector pin in the hole as shown. Push the connector pin into the hole until the stop ridge is down firmly against the circuit board. Then solder the connector pin to the foil.



- ( ) Connector pin at A.
- ( ) R4: 270  $\Omega$ , 2-watt (red-violet-brown).
- ( ) C6: .1  $\mu$ F Mylar.
- ( ) C4: .1  $\mu$ F Mylar.
- ( ) Solder all leads to the foil and cut off the excess lead lengths.
- ( ) Q1: 2N3643 transistor (#417-233). Refer to the Detail and identify the E, B, and C leads. Insert the leads into the indicated holes in the circuit board. Solder each lead to the foil and cut off the excess lead lengths.

**CONTINUE** ➡

NOTE: When you install electrolytic capacitors, match the positive (+) mark on the capacitor with the positive (+) mark on the circuit board. Since capacitor lengths vary, it may be necessary to form the negative lead on a longer capacitor as shown below. Be sure the positive lead does not touch the capacitor body.



- ( ) C5: 500  $\mu$ F electrolytic.
- ( ) C3: 2500  $\mu$ F electrolytic.
- ( ) Solder the leads to the foil and cut off the excess lead lengths.

PICTORIAL 2



## START

NOTE: When wiring this kit, you will be instructed to prepare the lengths of wire ahead of time. To prepare a wire in the next step, cut it to the indicated length and remove 3/8" of insulation from each end. Twist the small wires together and melt solder on the exposed wire ends. The wires are listed in the order in which they will be used.

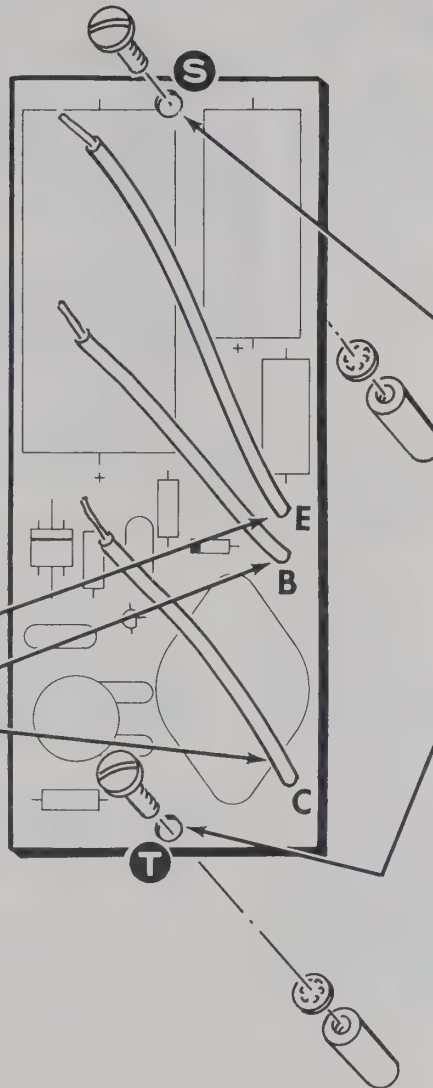
( ) Prepare the following lengths of brown wire. 5-1/2", 3-1/2", and 3-1/2".

( ) 5-1/2" wire at E.

( ) 3-1/2" wire at B.

( ) 3-1/2" wire at C.

( ) Solder the wires to the foil and cut off the excess lead lengths.



## CONTINUE

( ) Mount a 6-32 x 11/16" spacer to the circuit board (foil side) at S with a 6-32 x 3/8" screw and a #6 lockwasher.

( ) In a similar manner, mount a 6-32 x 11/16" spacer at T.

### CIRCUIT BOARD CHECKOUT

Carefully inspect the circuit board for the following conditions.

- ( ) Unsoldered connections.
- ( ) "Cold" solder connections.
- ( ) Solder bridges between foil patterns.
- ( ) Protruding leads which could touch together.
- ( ) Integrated circuit for the proper type and installation.
- ( ) Transistor for the proper type and installation.
- ( ) Electrolytic capacitors for the correct position of the positive (+) end.
- ( ) Diode for the correct position of the banded end.

The circuit board wire connections will be made later. Temporarily set the circuit board aside.

## FINISH

PICTORIAL 3

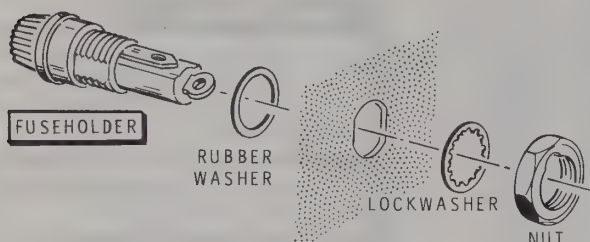




## CHASSIS ASSEMBLY

Refer to Pictorial 4 (fold-out from Page 11) for the following steps.

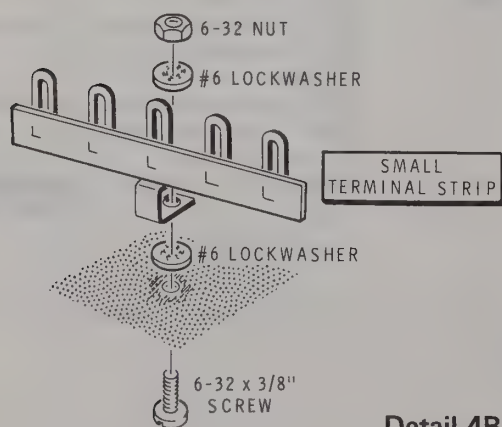
- ( ) Carefully peel the protective paper from the plastic feet and press a foot onto the chassis bottom at each corner. Do not cover the holes.
- ( ) Install a grommet at hole A.



**Detail 4A**

- ( ) Refer to Detail 4A and mount a fuseholder at F1 with the hardware supplied with the fuseholder. Be sure to position the lug as shown.
- ( ) In a similar manner, mount a fuseholder at F2.

**NOTE:** When hardware is used, the steps will give the size and type only. For example, "Use 6-32 x 3/8" hardware" means to use a 6-32 x 3/8" screw, one or more #6 lockwashers, and a 6-32 nut. Refer to the Detail for the proper installation of the hardware.



**Detail 4B**

- ( ) Refer to Detail 4B and install a terminal strip at B with 6-32 x 3/8" hardware.

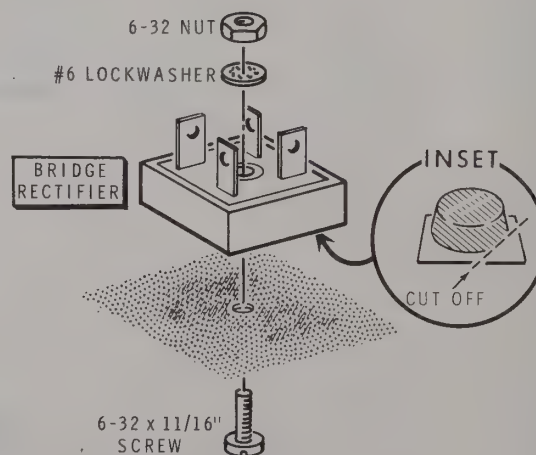
### WARNING:

The thermal compound used in the following step (and later) can be injurious to both your eyes and your clothes. Handle it with utmost care.

**KEEP THE COMPOUND AWAY FROM YOUR EYES.** Wash your hands immediately after you use the compound. Should you get any in your eyes, wash your eyes with water at once and see a doctor as soon as possible.

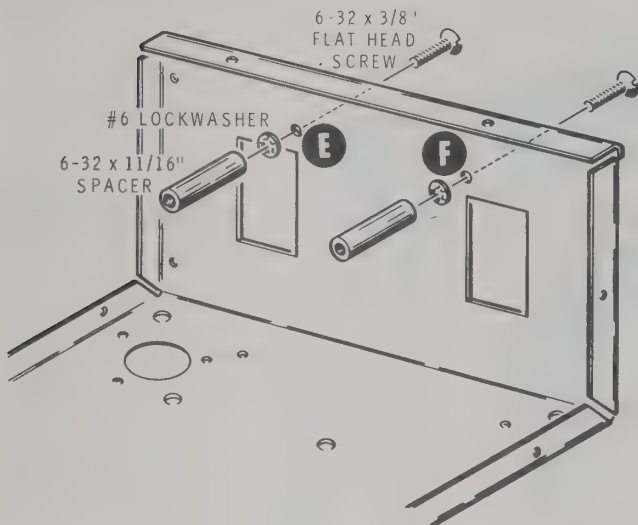
**KEEP THE COMPOUND OFF YOUR CLOTHES.** If you get the compound on your clothes it may leave a permanent white stain.

- ( ) BR1: Refer to the inset drawing in Detail 4C and open the thermal grease pod. Spread a thin layer of the thermal grease on the large flat side of the MDA990-2 bridge rectifier (#57-88). Save the remaining thermal grease for use later.
- ( ) Refer to Detail 4C and install the bridge rectifier at BR1 with 6-32 x 11/16" hardware. Position the positive (+) and negative (–) lugs as shown in Pictorial 4.



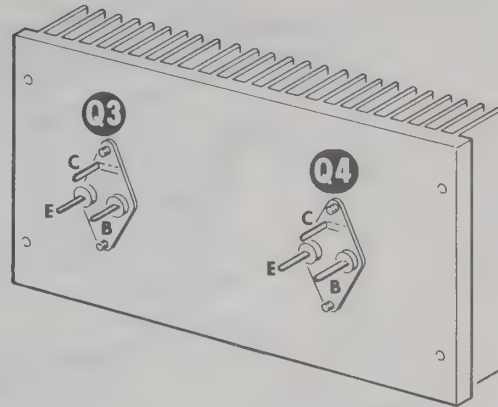
**Detail 4C**





Detail 4D

- ( ) Refer to Detail 4D and mount a 6-32 x 11/16" spacer at E with a 6-32 x 3/8" flat head screw and a #6 lockwasher.
- ( ) In a similar manner, mount a 6-32 x 11/16" spacer at F.
- ( ) Refer to Detail 4E and mount the circuit board at G and H with 6-32 x 3/8" hardware.

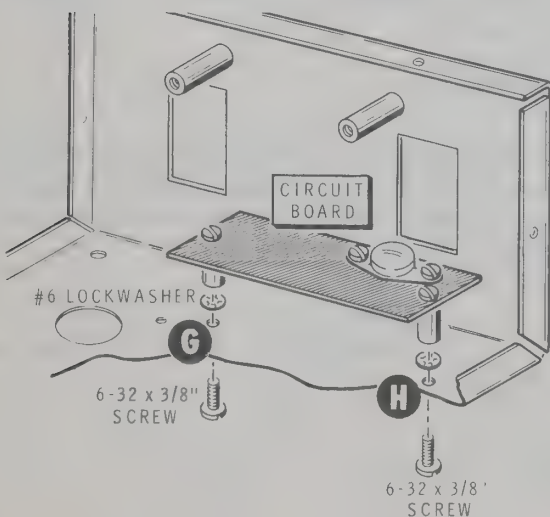


PICTORIAL 5

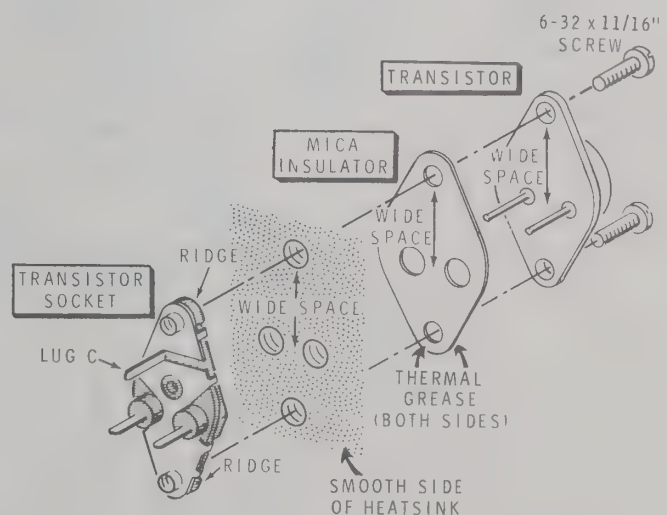
Refer to Pictorial 5 in the following steps.

NOTE: As you mount transistors, line up the wide space on the transistor, mica insulator, heat sink, and transistor socket. Be sure the transistor socket ridges seat properly in the mounting holes when you tighten the screws.

- ( ) Q3: Refer to Detail 5A and install a 40411 transistor (#417-139), mica insulator, and transistor socket on the heat sink at Q3 with two 6-32 x 11/16" screws. Spread a thin layer of thermal grease on both sides of the mica insulator.
- ( ) Q4: In a similar manner, mount a 40411 transistor (#417-139) at Q4.



Detail 4E



Detail 5A



## CHASSIS ASSEMBLY

Refer to Pictorial 4 (fold-out from Page 11) for the following steps.

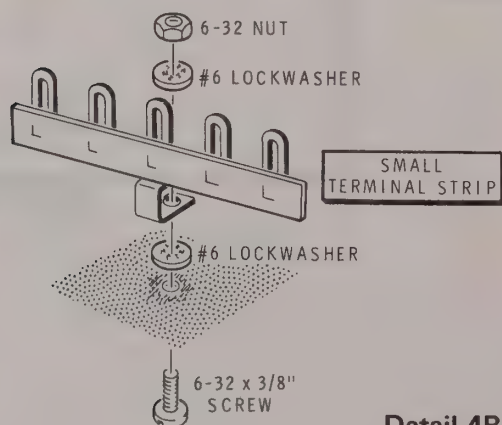
- ( ) Carefully peel the protective paper from the plastic feet and press a foot onto the chassis bottom at each corner. Do not cover the holes.
- ( ) Install a grommet at hole A.



Detail 4A

- ( ) Refer to Detail 4A and mount a fuseholder at F1 with the hardware supplied with the fuseholder. Be sure to position the lug as shown.
- ( ) In a similar manner, mount a fuseholder at F2.

NOTE: When hardware is used, the steps will give the size and type only. For example, "Use 6-32 x 3/8" hardware" means to use a 6-32 x 3/8" screw, one or more #6 lockwashers, and a 6-32 nut. Refer to the Detail for the proper installation of the hardware.



Detail 4B

- ( ) Refer to Detail 4B and install a terminal strip at B with 6-32 x 3/8" hardware.

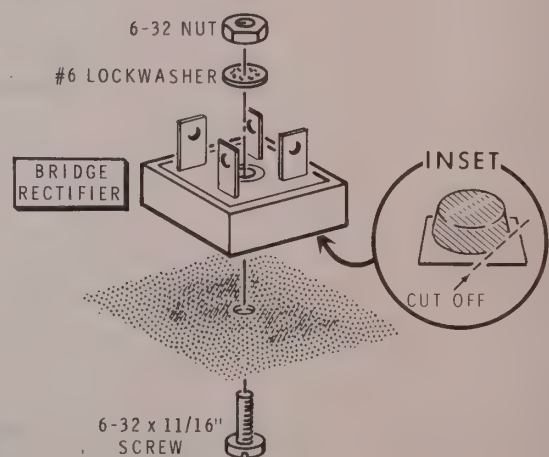
### WARNING:

The thermal compound used in the following step (and later) can be injurious to both your eyes and your clothes. Handle it with utmost care.

KEEP THE COMPOUND AWAY FROM YOUR EYES. Wash your hands immediately after you use the compound. Should you get any in your eyes, wash your eyes with water at once and see a doctor as soon as possible.

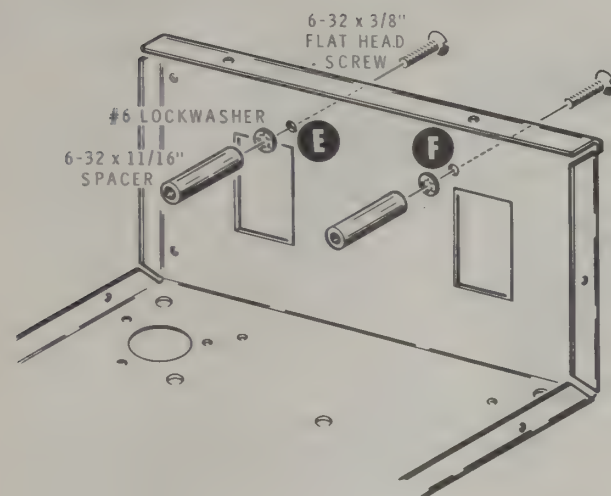
KEEP THE COMPOUND OFF YOUR CLOTHES. If you get the compound on your clothes it may leave a permanent white stain.

- ( ) BR1: Refer to the inset drawing in Detail 4C and open the thermal grease pod. Spread a thin layer of the thermal grease on the large flat side of the MDA990-2 bridge rectifier (#57-88). Save the remaining thermal grease for use later.
- ( ) Refer to Detail 4C and install the bridge rectifier at BR1 with 6-32 x 11/16" hardware. Position the positive (+) and negative (-) lugs as shown in Pictorial 4.



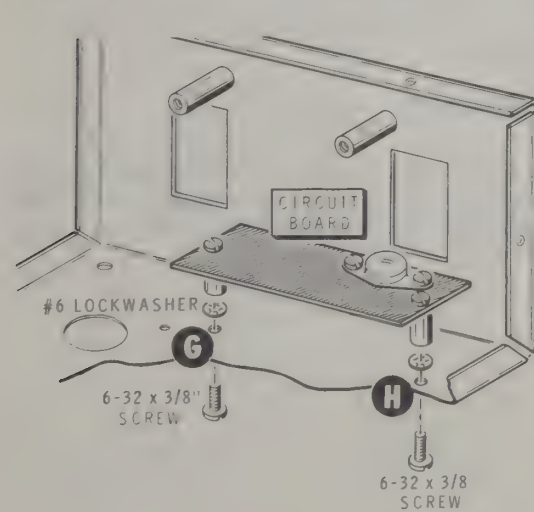
Detail 4C



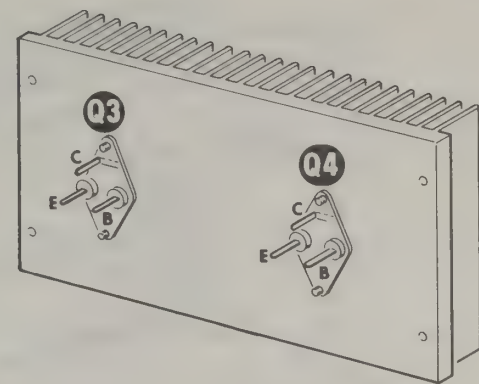


Detail 4D

- ( ) Refer to Detail 4D and mount a 6-32 x 11/16" spacer at E with a 6-32 x 3/8" flat head screw and a #6 lockwasher.
- ( ) In a similar manner, mount a 6-32 x 11/16" spacer at F.
- ( ) Refer to Detail 4E and mount the circuit board at G and H with 6-32 x 3/8" hardware.



Detail 4E

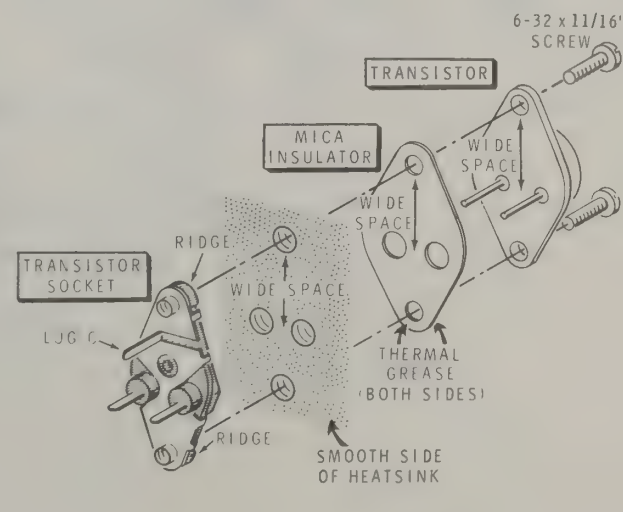


PICTORIAL 5

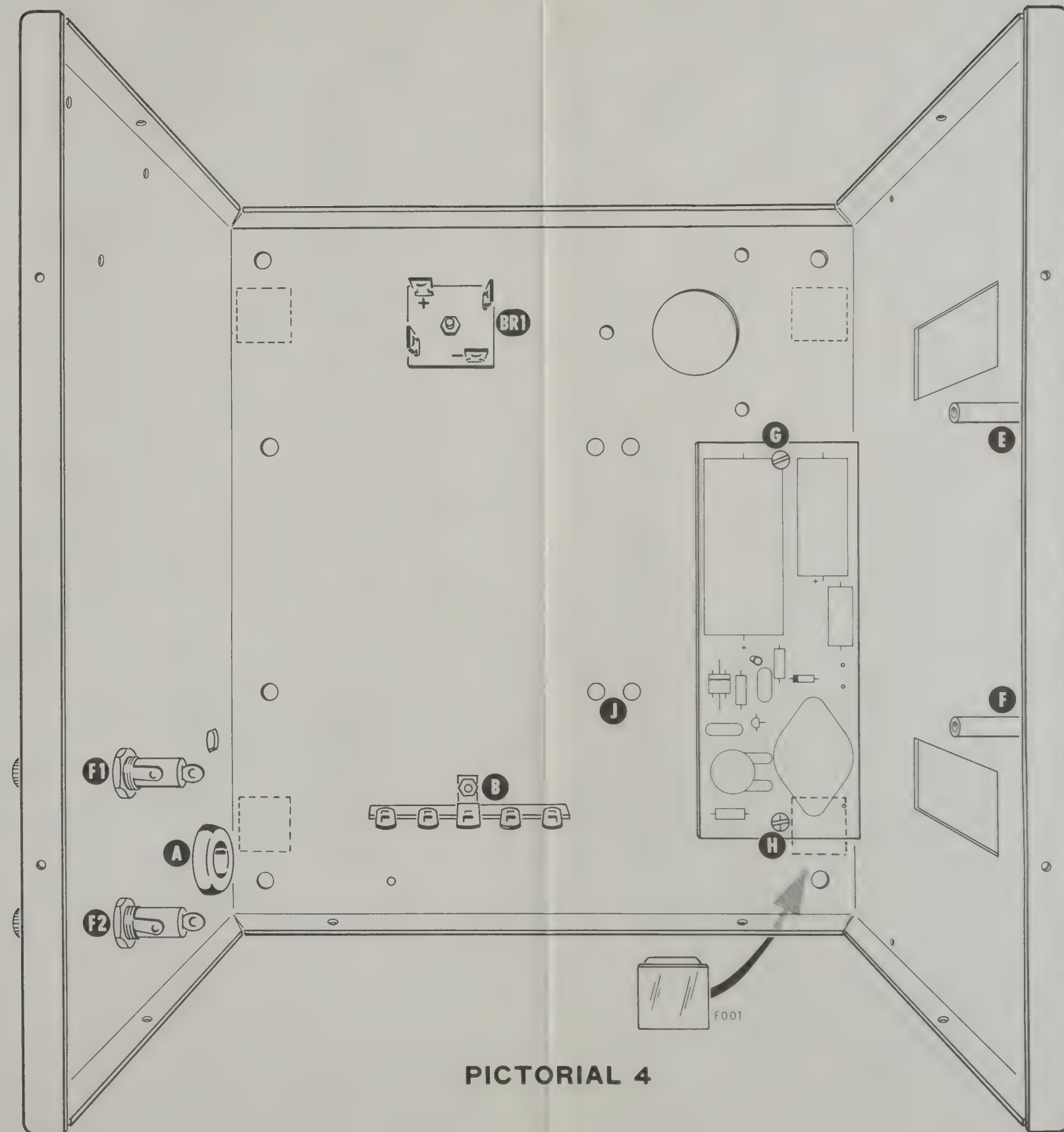
Refer to Pictorial 5 in the following steps.

NOTE: As you mount transistors, line up the wide space on the transistor, mica insulator, heat sink, and transistor socket. Be sure the transistor socket ridges seat properly in the mounting holes when you tighten the screws.

- ( ) Q3: Refer to Detail 5A and install a 40411 transistor (#417-139), mica insulator, and transistor socket on the heat sink at Q3 with two 6-32 x 11/16" screws. Spread a thin layer of thermal grease on both sides of the mica insulator.
- ( ) Q4: In a similar manner, mount a 40411 transistor (#417-139) at Q4.

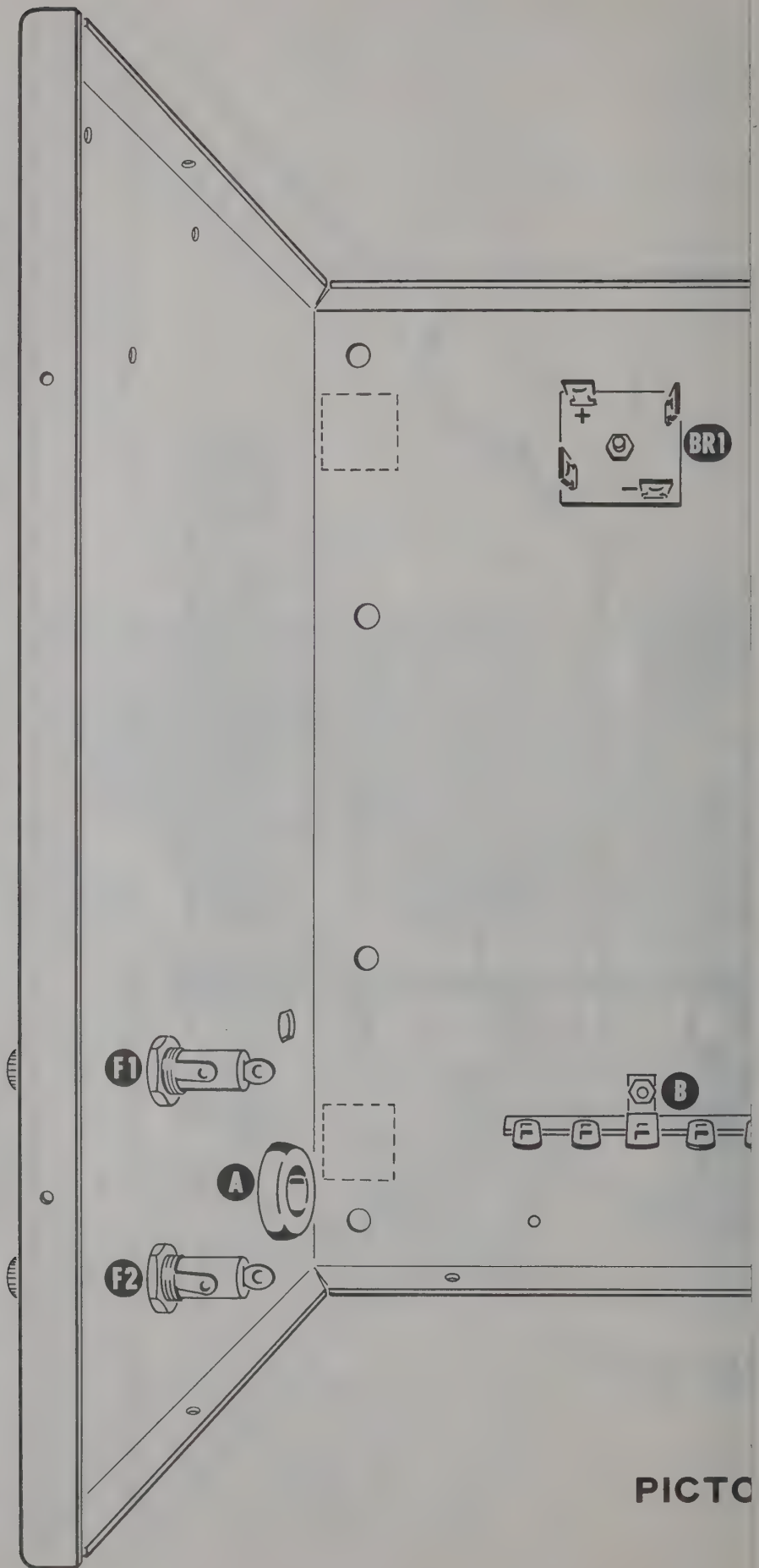


Detail 5A



PICTORIAL 4





PICTO



Prepare the following lengths of wire and sleeving.

WIRE	SLEEVEING
( ) 5-1/4"	4-1/4"
( ) 4"	3"
( ) 6"	4-3/4"
( ) 13"	9-1/2"
( ) 3"	1"
( ) 3-1/4"	1-1/4"

NOTE: In the following steps, (NS) means not to solder because other wires will be added later. "S—" with a number, such as (S-3), means to solder the connection. The number following "S" tells how many wires are at the connection. Use special care when you solder these connections. Apply enough heat and solder so that each wire is properly soldered.

( ) Connect this 5-1/4" wire between Q3 lug C (NS) and Q4 lug C (NS).

( ) Refer to part 2 and form the 4" wire as shown.

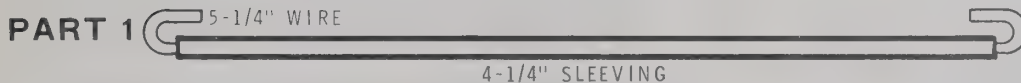
( ) Connect this wire to Q3 lug C (S-2).

( ) Refer to part 3 and form the 6" wire as shown.

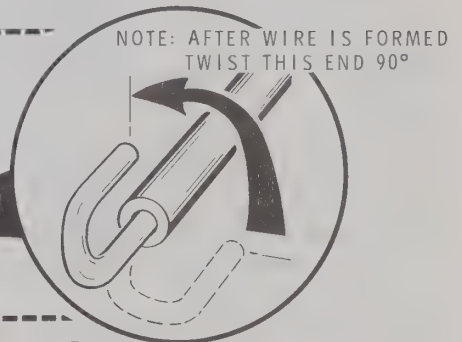
( ) Connect this wire between Q3 lug B (S-1) and Q4 lug B (NS). Be careful you do not solder the transistor pins to the socket lugs.

NOTE: As you install each wire, form the wire to the respective outline given in Detail 6B. Be careful not to damage the connecting lugs.

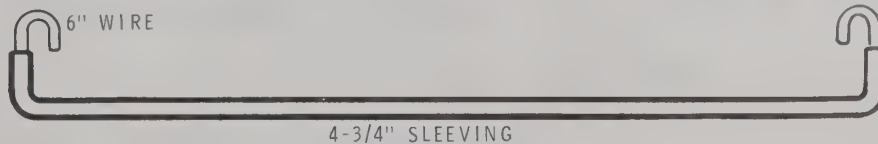
( ) Refer to part 1 and form the 5-1/4" wire as shown.



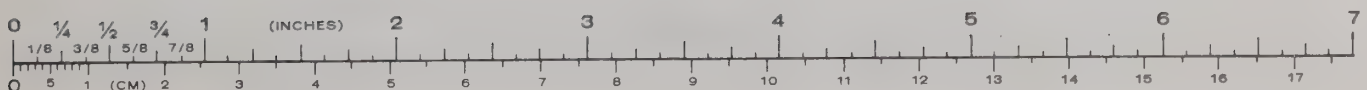
**PART 2**



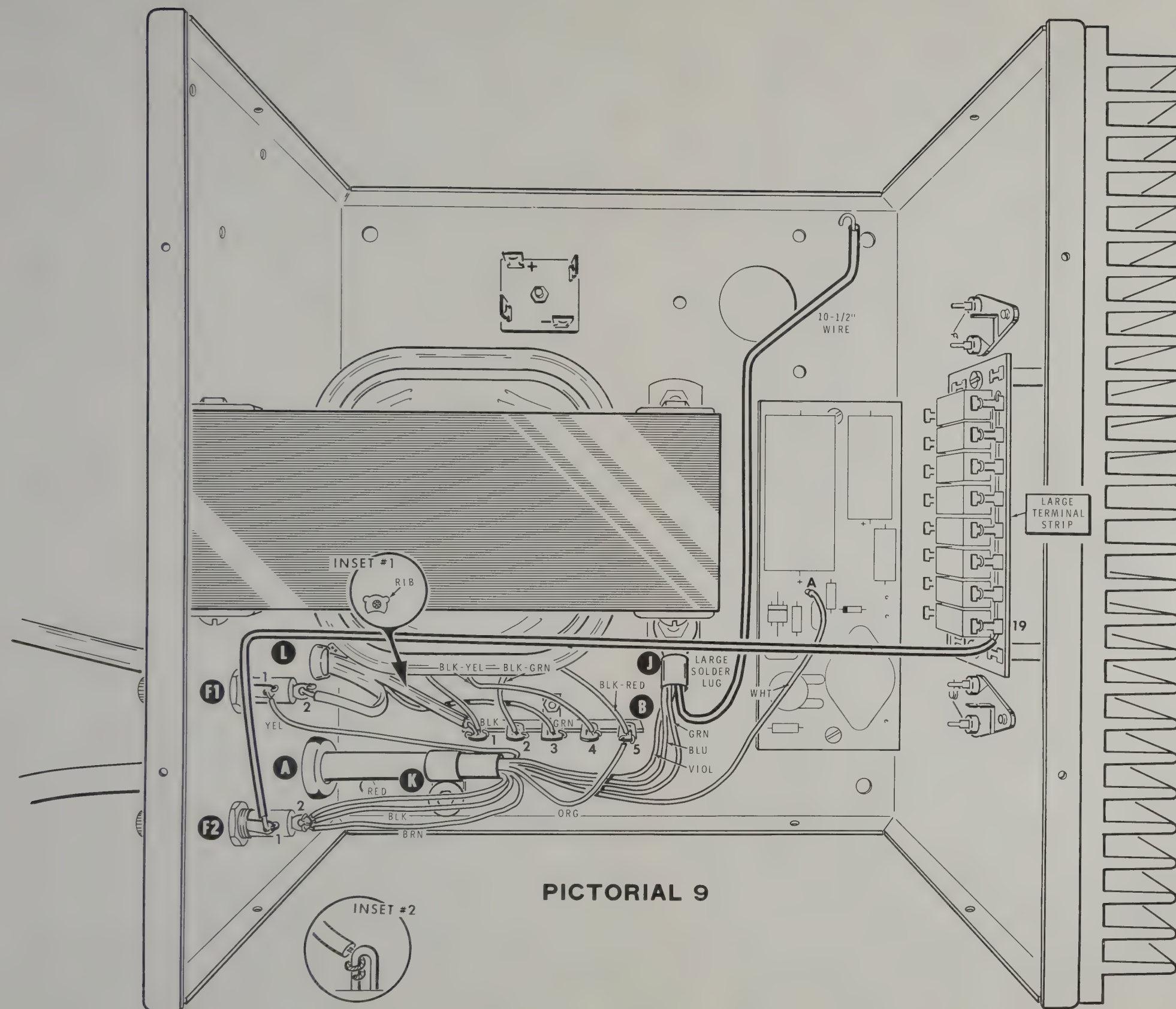
**PART 3**



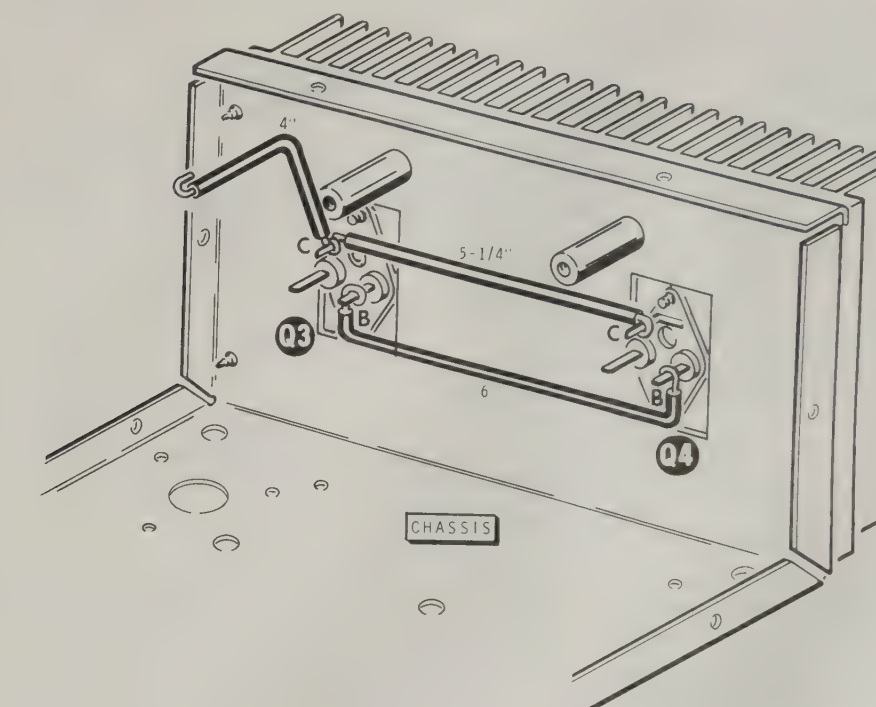
Detail 6B



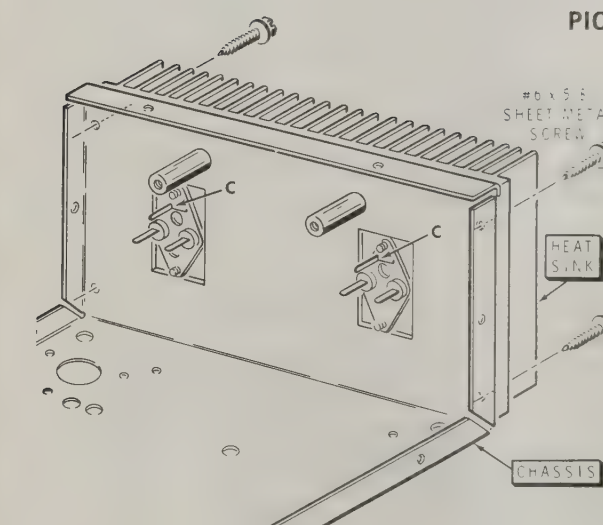




PICTORIAL 9



PICTORIAL 6



Detail 6A

Refer to Pictorial 6 for the following steps.

- ( ) Refer to Detail 6A and mount the heat sink on the rear of the chassis panel with four #6 x 5/8" sheet metal screws. Position the heat sink so the C lugs are up as shown.

#### CHASSIS WIRING

NOTE: To prepare bare wire in the following steps, cut the bare wire and sleeving to the indicated lengths; then place the sleeving on the wire. The wires will be used in the order they are listed.



Prepare the following lengths of wire and sleeving.

WIRE	SLEEVING
( ) 5-1/4"	4-1/4"
( ) 4"	3"
( ) 6"	4-3/4"
( ) 13"	9-1/2"
( ) 3"	1"
( ) 3-1/4"	1-1/4"

NOTE: In the following steps, (NS) means not to solder because other wires will be added later. "S—" with a number, such as (S-3), means to solder the connection. The number following "S" tells how many wires are at the connection. Use special care when you solder these connections. Apply enough heat and solder so that each wire is properly soldered.

( ) Connect this 5-1/4" wire between Q3 lug C (NS) and Q4 lug C (NS).

( ) Refer to part 2 and form the 4" wire as shown.

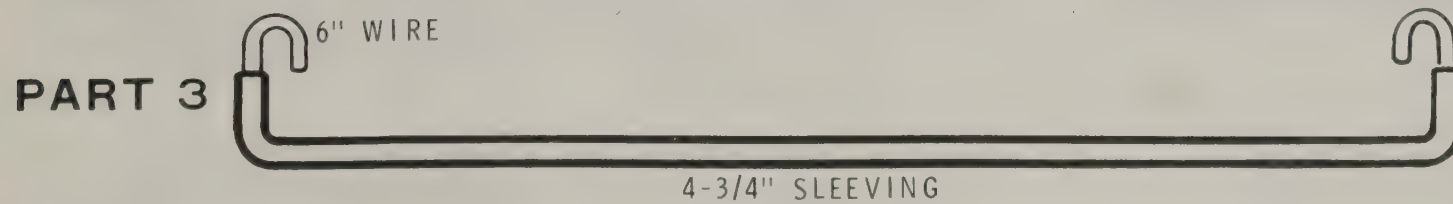
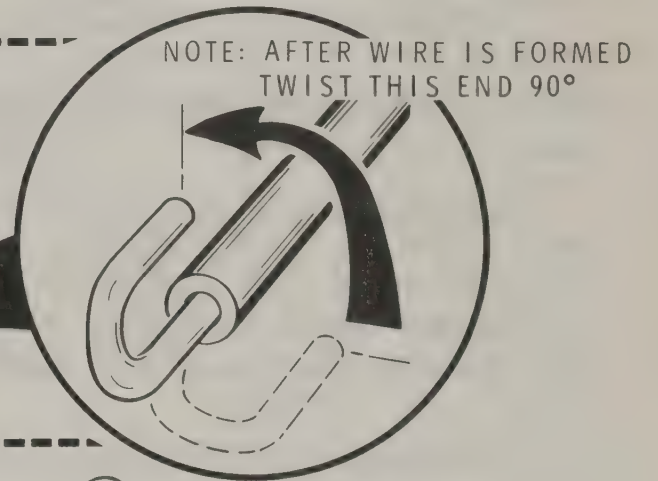
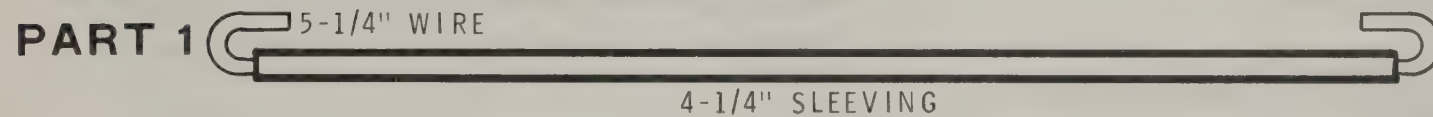
( ) Connect this wire to Q3 lug C (S-2).

( ) Refer to part 3 and form the 6" wire as shown.

( ) Connect this wire between Q3 lug B (S-1) and Q4 lug B (NS). Be careful you do not solder the transistor pins to the socket lugs.

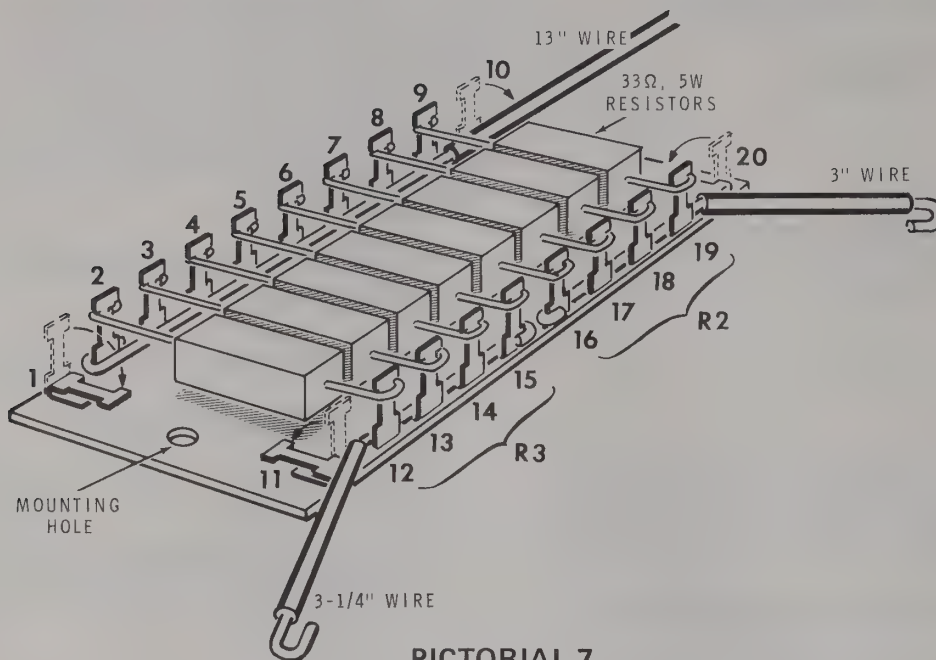
NOTE: As you install each wire, form the wire to the respective outline given in Detail 6B. Be careful not to damage the connecting lugs.

( ) Refer to part 1 and form the 5-1/4" wire as shown.



Detail 6B





PICTORIAL 7

Refer to Pictorial 7 in the following steps.

- ( ) Locate the terminal board and bend over the lug at each corner (lugs 1, 10, 11, and 20).

Form the following wires as shown in Detail 7A.

- ( ) Refer to part 1 and form a 13" wire as shown.
- ( ) Connect the 13" wire to one row of lugs (2 through 9) on the terminal board; solder the wire to each lug.
- ( ) Refer to part 2 and form the 3" wire as shown.

- ( ) Connect this wire to lugs 16, 17, 18, and 19 on the terminal board; solder the bare wire to each lug.

- ( ) Refer to part 3 and form the 3-1/4" wire as shown.

- ( ) Connect this wire to lugs 12, 13, 14, and 15 on the terminal board; solder the bare wire to each lug.

NOTE: Resistors R2 and R3 are made up four resistors each.

- ( ) R2, R3: Connect a .33  $\Omega$ , 5-watt resistor between lugs 2 and 12 as shown. In a similar manner, connect seven .33  $\Omega$ , 5-watt resistors as shown. Position the resistors up off of the terminal board and the end resistors away from the mounting holes. Solder the resistors as you install them.

## PART 1



## PART 2

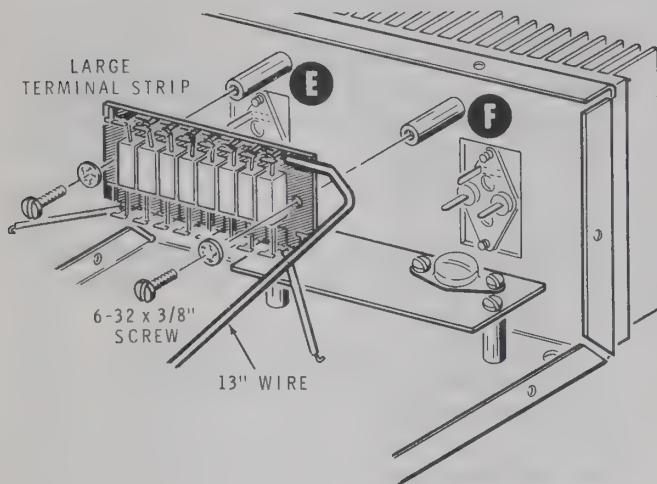


## PART 3



Detail 7A

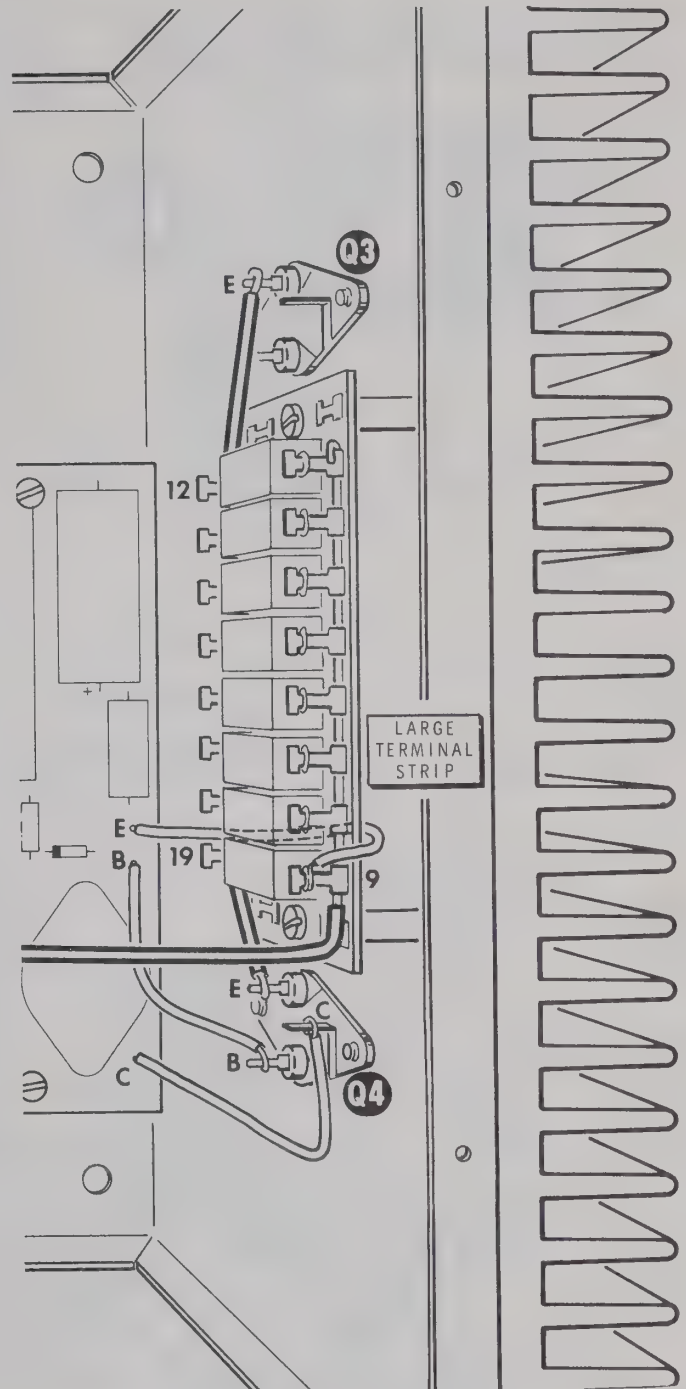




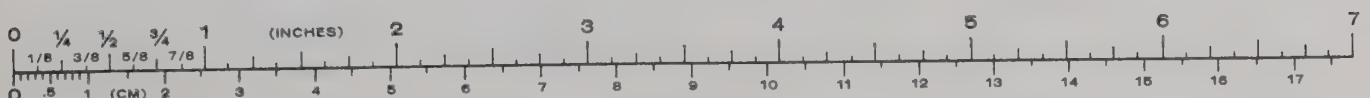
Detail 8A

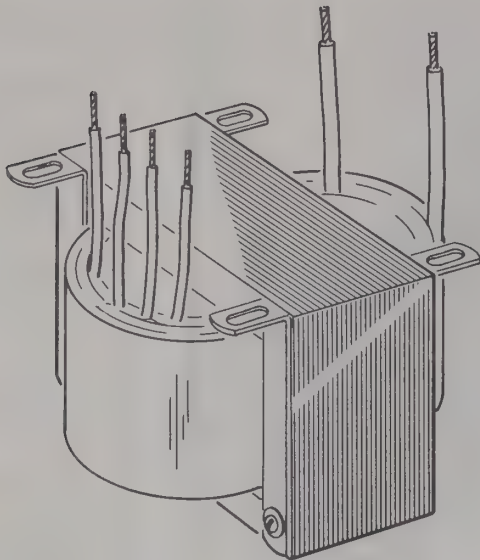
Refer to Pictorial 8 for the following steps.

- ( ) Position the terminal board on the spacers at E and F. Form the short wires from the terminal board so the wire ends fit over Q3 lug E, and Q4 lug E.
- ( ) Refer to Detail 8A and mount the terminal board to spacers E and F with 6-32 x 3/8" screws and #6 lockwashers. Form the 13" wire as shown.
- ( ) Connect the wire coming from large terminal strip lug 12 to Q3 lug E (S-1).
- ( ) Connect the wire coming from the large terminal strip lug 19 to Q4 lug E (S-1).
- ( ) Connect the wire coming from circuit board hole C to Q4 lug C (S-2).
- ( ) Connect the wire coming from circuit board hole B to Q4 lug B (S-2).
- ( ) Connect the wire coming from circuit board hole E to terminal board lug 9 (S-1). Note, other wires have already been soldered to this lug.



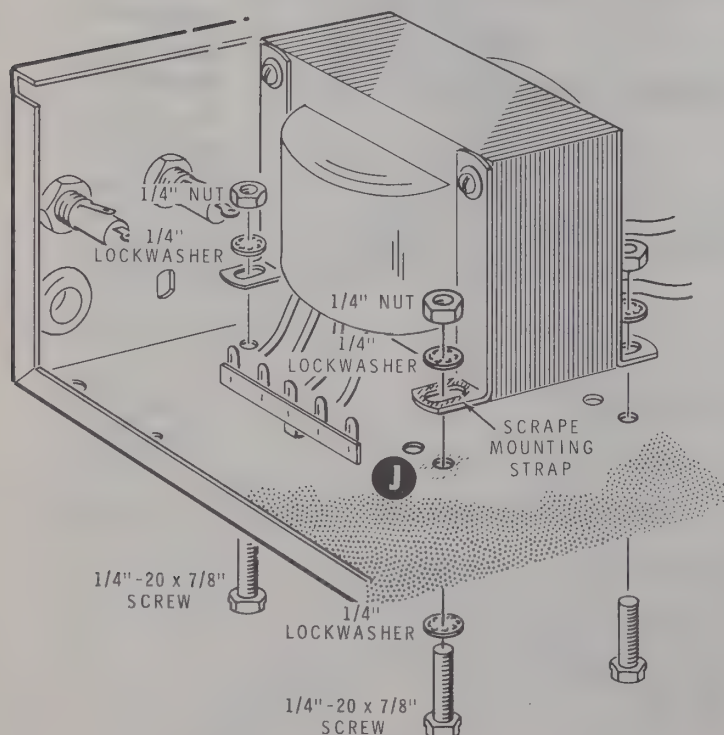
PICTORIAL 8



**Detail 9A**

Refer to Pictorial 9 (fold-out from Page 12) for the following steps.

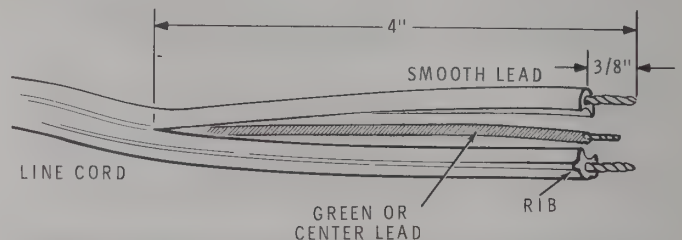
- ( ) Refer to Detail 9A and straighten the transformer leads as shown.

**Detail 9B**

- ( ) Refer to Detail 9B and scrape the top and bottom areas of the indicated transformer mounting strap.
- ( ) Mount the transformer with 1/4" - 20 x 7/8" hardware; position the transformer and leads as shown, and slide the transformer in from the side. Note the extra lockwasher at hole J and disregard the two unused holes.

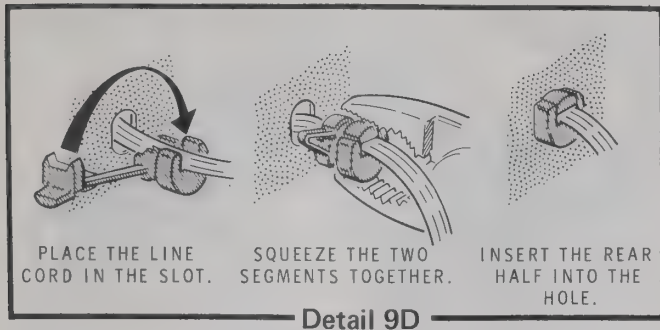
NOTE: Refer to inset drawing #2 and make mechanically secure connections as you wire the transformer and line cord in the following steps.

- ( ) Connect the black-red transformer lead to lug 5 of terminal strip B (NS).
- ( ) Connect the black-yellow transformer lead to lug 4 of terminal strip B (NS).
- ( ) Connect the black-green transformer lead to lug 2 of terminal strip B (NS).
- ( ) Connect the black transformer lead to lug 1 of terminal strip B (NS).

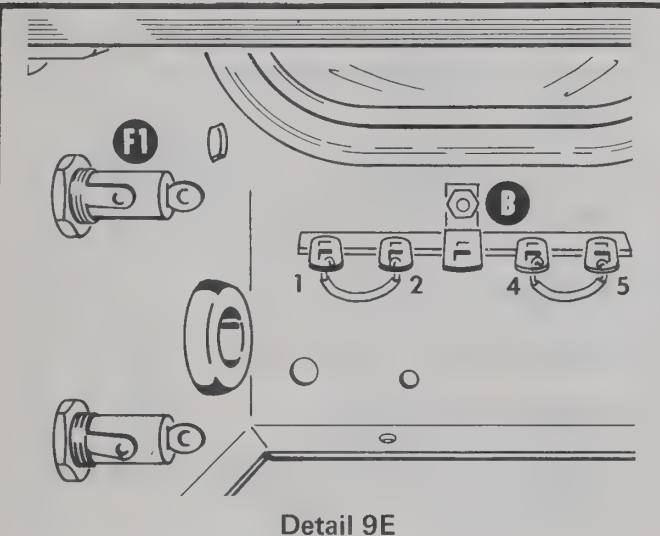
**Detail 9C**

- ( ) Refer to Detail 9C and separate the wires at the free end of the line cord 4". Prepare the wire ends as shown. Note that there is a smooth lead and a ribbed lead as shown in inset drawing #1.
- ( ) Insert the prepared end of the line cord through hole L and connect the smooth lead to fuseholder F1 lug 2 (S-1). Make a mechanically secure connection.
- ( ) Securely connect the ribbed lead to terminal strip B lug 1 (NS).
- ( ) Securely connect the green or center lead to terminal strip B lug 3 (S-1).
- ( ) Refer to Detail 9D and install a strain relief on the line cord at hole L.





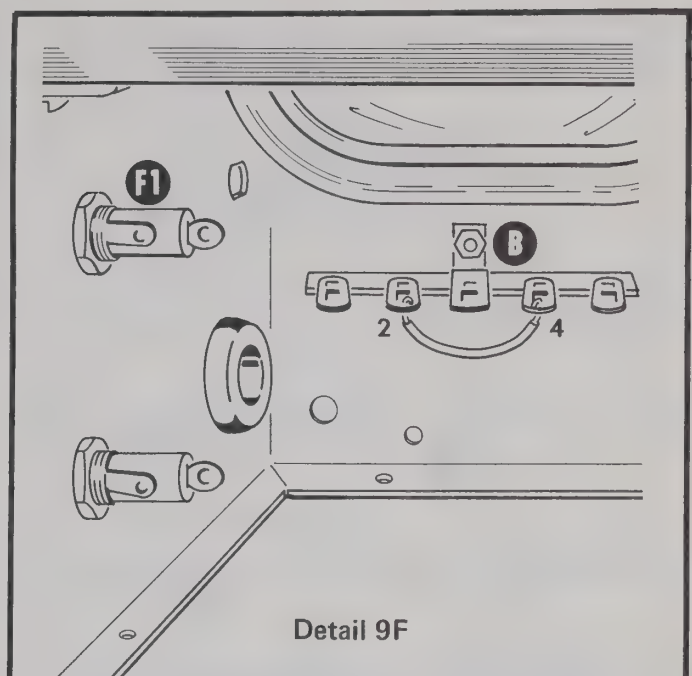
NOTE: Two different sets of wiring instructions are given in the following steps. One set of instructions is for 120-VAC line voltage (most often used in the United States), and the other is for 240-VAC line voltage. Use only the instructions that agree with the line voltage in your area. The 7-ampere fuse supplied with this kit is for 120-VAC use only.



### For 120 VAC Only

Refer to Detail 9E for the following steps.

- ( ) Prepare two 2" lengths of brown wire.
- ( ) Connect a 2" wire between lugs 1 (S-3) and 2 (S-2) of terminal strip B.
- ( ) Connect the other 2" wire between lugs 4 (S-2) and 5 (NS) of terminal strip B.
- ( ) F1: Turn the fuseholder cap counterclockwise and install a 7-ampere fuse.



### For 240 VAC Only

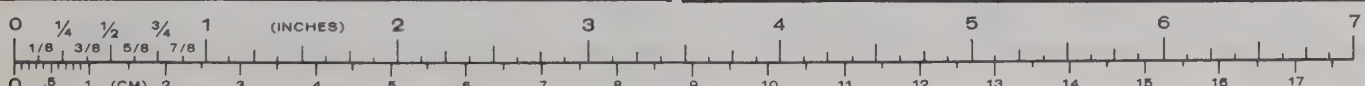
Refer to Detail 9F for the following steps.

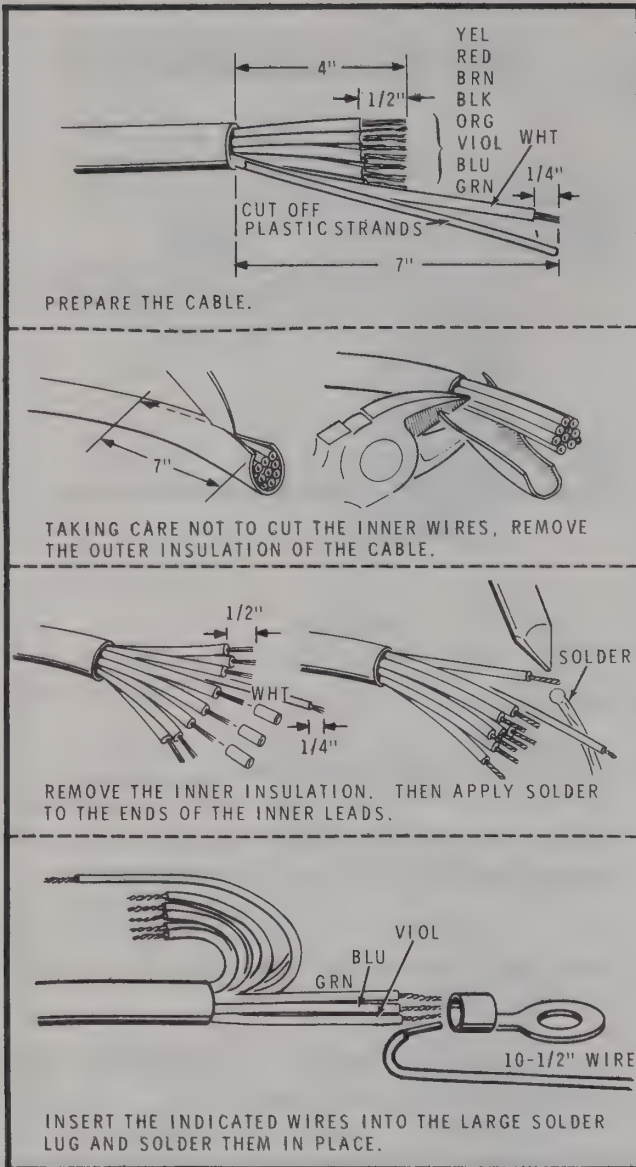
- ( ) Prepare a 2" length of brown wire and connect it between lugs 2 (S-2) and 4 (S-2) of terminal strip B.
- ( ) Solder the wires connected to lug 1 (S-2) of terminal strip B.
- ( ) F1: Turn the fuseholder cap counterclockwise and install a 4-ampere fuse (not supplied).

NOTE: The plug on the power cord in this kit is for standard 120 VAC outlets. For 240 VAC operation in the U.S.A., cut off the plug and replace it with a permanent plug that matches your 240 VAC receptacle. Be sure your power connection conforms with section 210-21 (b) of the National Electric Code, which reads in part:

"Receptacles connected to circuits having different voltages, frequencies, or types of current (AC or DC) on the same premises shall be of such design that attachment plugs used on such circuits are not interchangeable."

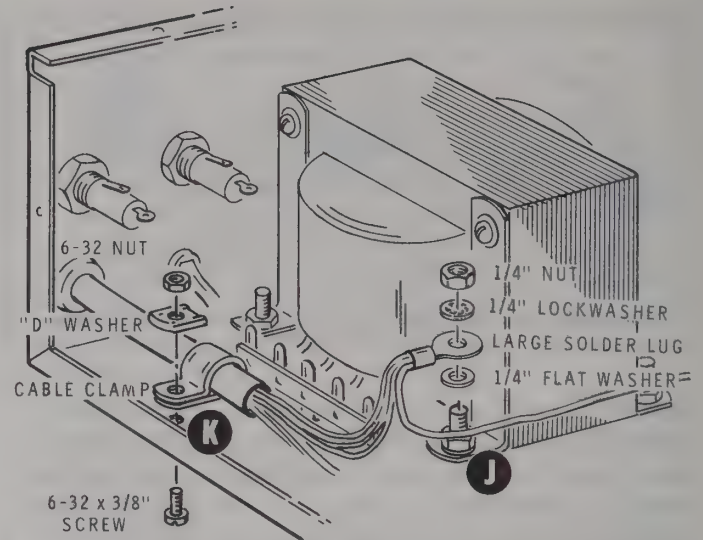
When you install a new plug, make sure you connect it according to your local electrical code. Keep in mind that the green, or center, line cord wire is connected to the power supply chassis.





Detail 9G

- ( ) Insert one end of the cable through grommet A.
- ( ) Refer to Detail 9G and prepare the cable as shown.
- ( ) Cut a 10-1/2" length of bare wire. Place a 9-3/4" length of sleeving on this wire.
- ( ) Refer to Pictorial 9 and form the wire as shown.
- ( ) Connect the green, blue, violet cable wires and the prepared 10-1/2" wire into the large solder lug (S-4).



Detail 9H

- ( ) Refer to Detail 9H and mount the large solder lug at J with a 1/4" nut, 1/4" lockwasher, and 1/4" flat washer.
- ( ) Mount a cable clamp at K on the cable with 6-32 x 3/8" hardware and a "D" washer as shown.

Connect the cable wires as follows:

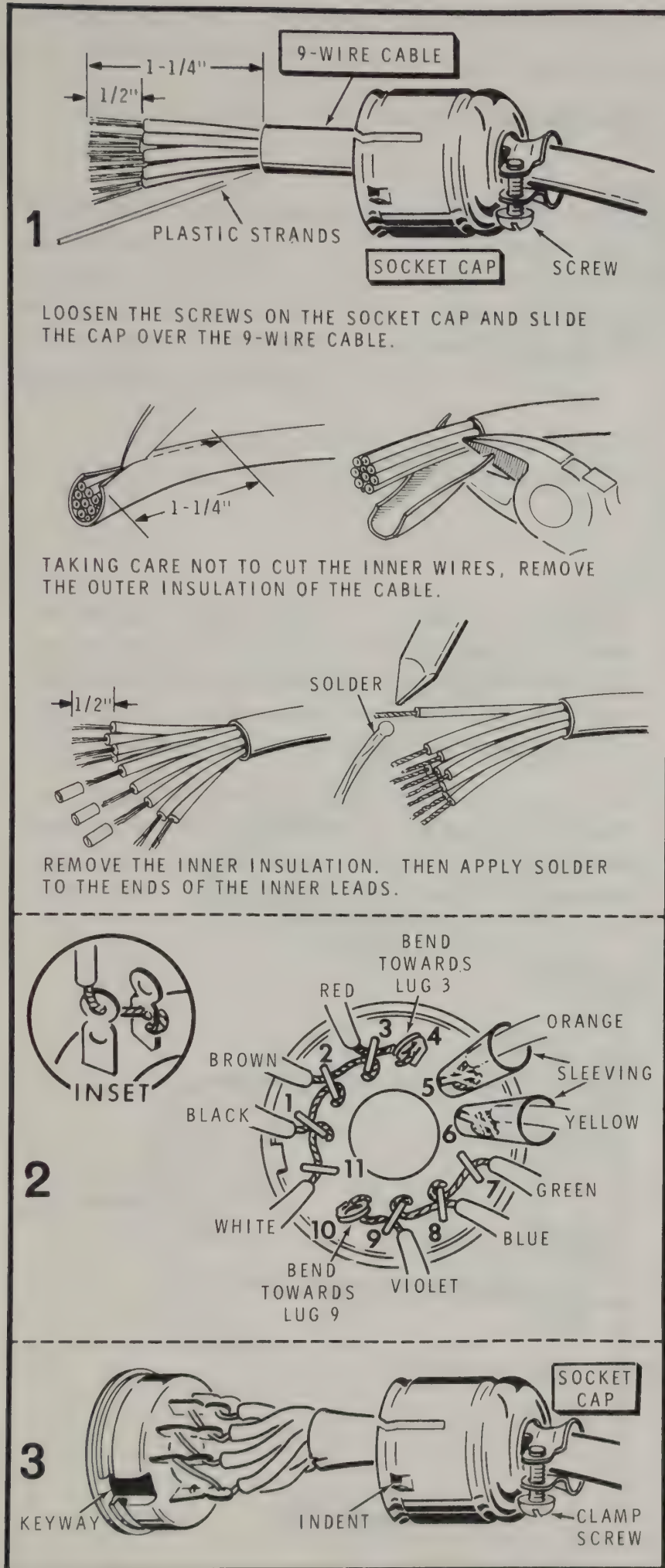
- ( ) White to circuit board connector pin A (S-1).
- ( ) Yellow to fuseholder F1 lug 1 (S-1).
- ( ) Orange to terminal strip B lug 5 (S-3). (S-2 for 240 VAC.)
- ( ) Red to fuseholder F2 lug 2 (NS).
- ( ) Black to fuseholder F2 lug 2 (NS).
- ( ) Brown to fuseholder F2 lug 2 (S-3).
- ( ) Connect the 13" solid wire from the terminal board to fuseholder F2 lug 1 (S-1).

Refer to Pictorial 10 for the following steps.

- ( ) Refer to part 1 and prepare the free end of the cable. Cut off the small black plastic strands.
- ( ) Place the socket cap on the cable.







PICTORIAL 10

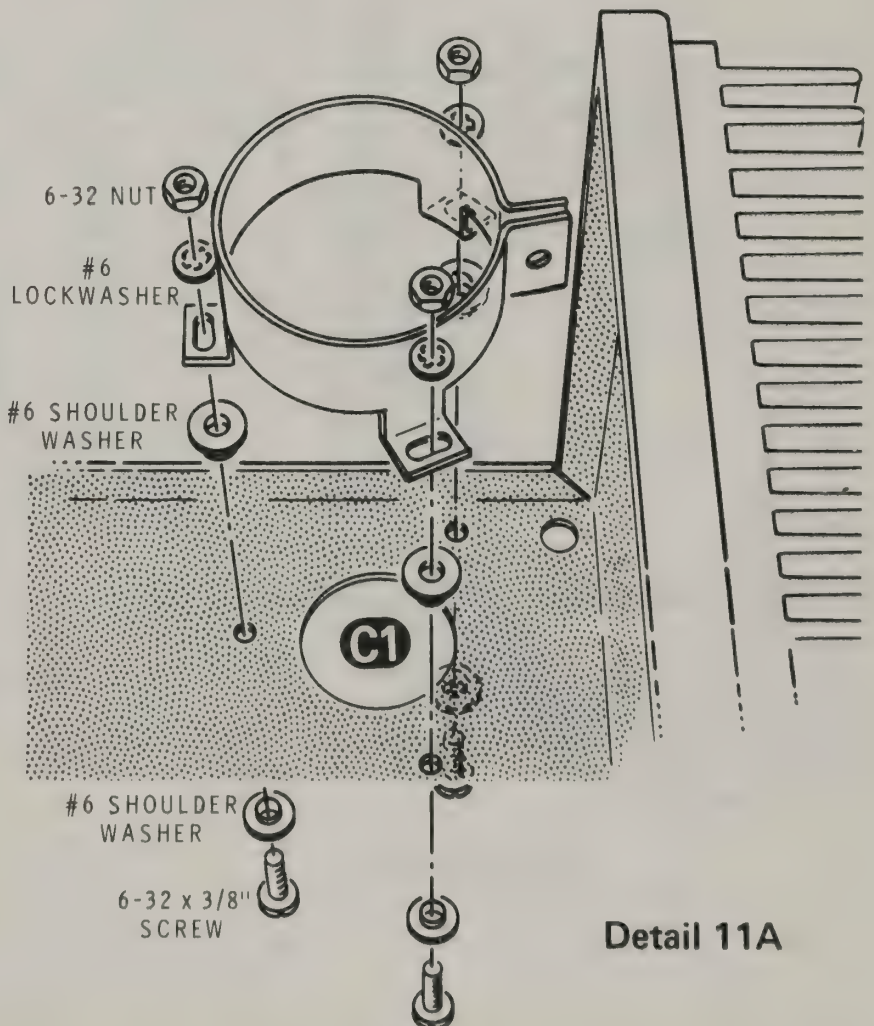
- ( ) Locate the clear sleeving and cut if in half. Place these lengths on the orange and yellow wires.

- ( ) Refer to Part 2 of the Detail and the inset and connect the wires to the socket lugs as shown. Solder the wires at each lug.
- ( ) Slide the lengths of insulation down over the connections at lugs 5 and 6.
- ( ) Refer to Part 3 of the Detail, line up the socket cap indent with the socket keyway, and press the cap onto the socket. Then tighten the clamp screws.

Refer to Pictorial 11 (fold-out from Page 23) for the following steps.

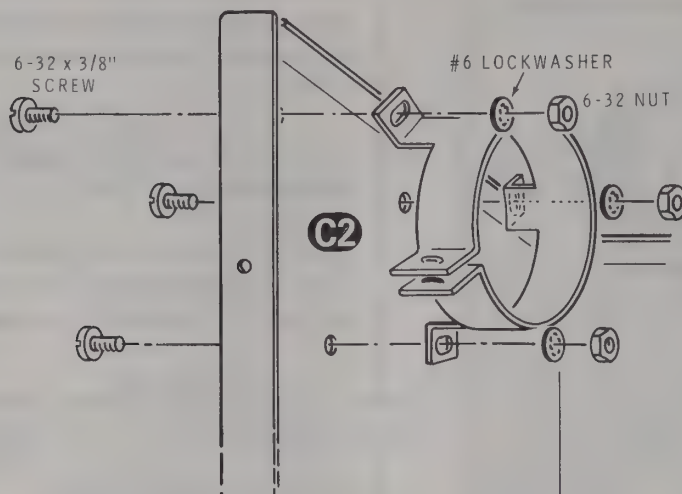
- ( ) Position the chassis as shown.
- ( ) Connect one transformer white lead to bridge rectifier BR1 lug 2 (S-1). Wrap the lead on the lug.
- ( ) Connect the other transformer white lead to bridge rectifier BR1 lug 4 (S-1). Wrap the lead on the lug.

NOTE: In the following steps, do not tighten the clamp hardware until the steps indicate.



Detail 11A

- ( ) Refer to Detail 11A and mount a clamp at C1 in the position shown. Use 6-32 x 3/8" hardware and six #6 fiber shoulder washers.

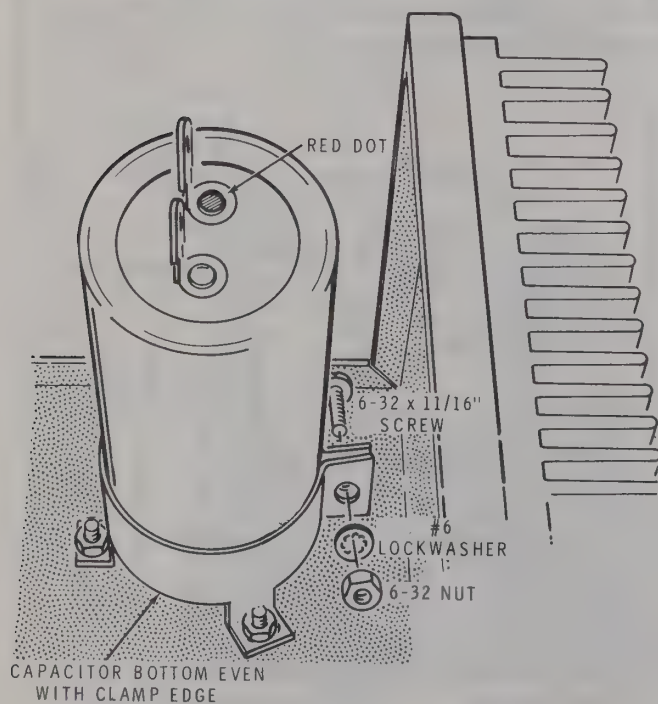


Detail 11B

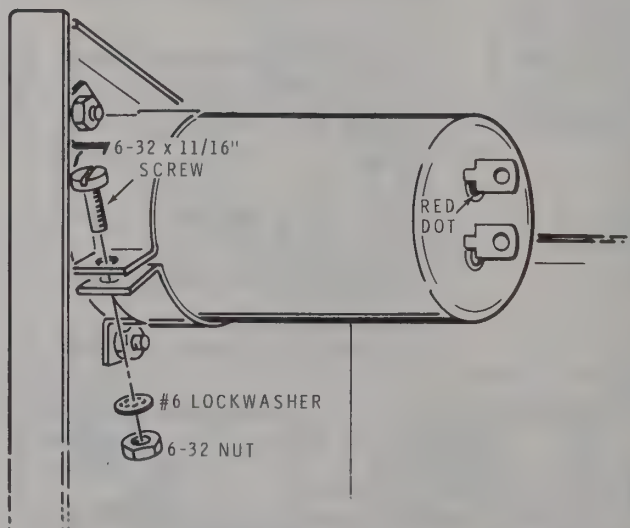
- ( ) Install 6-32x 11/16" hardware in each clamp.
- ( ) Refer to Detail 11B and mount a clamp at C2 with 6-32 x 3/8" hardware.

- ( ) C1: Refer to Detail 11C and install a 10,000  $\mu$ F electrolytic capacitor in the clamp at C1. Position the capacitor bottom even with the clamp edge and the red dot to the chassis side edge as shown. Tighten the clamp screw; then tighten the clamp mounting screws.

- ( ) C2: Refer to Detail 11D and install a 10,000  $\mu$ F electrolytic capacitor in the clamp at C2. Position the red dot as shown and press the capacitor bottom tight against the chassis. Tighten the clamp screw; then tighten the clamp mounting screws.



Detail 11C



Detail 11D



( ) Cut two 6-1/4" bare wires. Place one 2-1/2" length of sleeving on each wire.

( ) Refer to Detail 11E, and form these wires as shown.

NOTE: Where a wire passes through a connection and then goes to another point, as in the next step, it will count as two wires in the solder instructions (S-2) one entering and one leaving the connection. Be especially careful, when soldering these connections, to apply enough solder and heat to solder these "through wires".

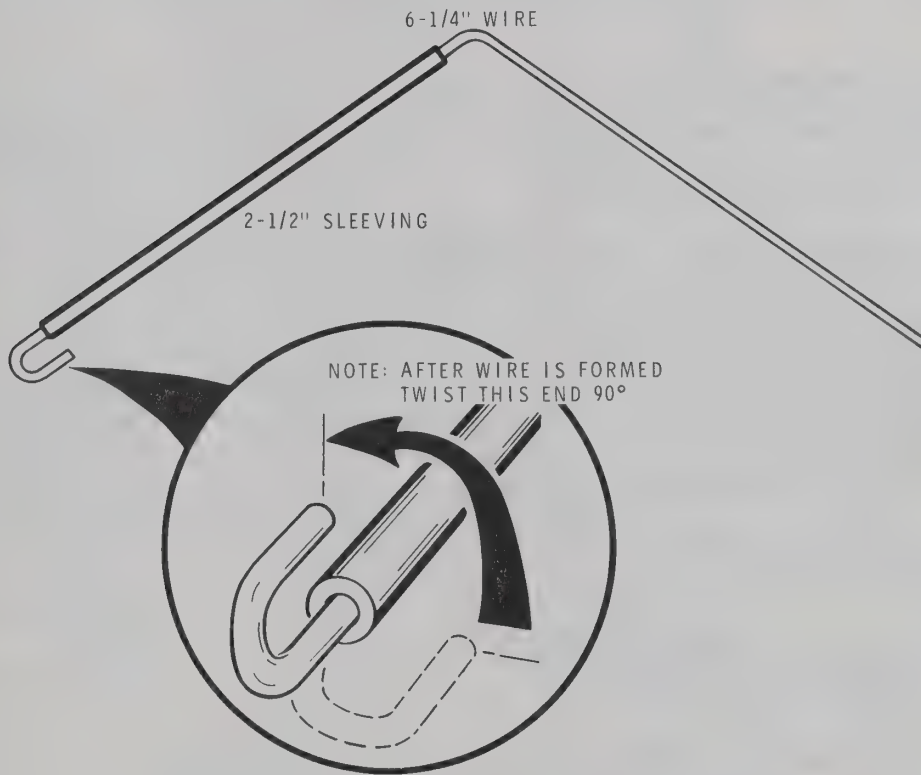
( ) Connect one wire from bridge rectifier BR1 lug 3 (S-1) through capacitor C2 lug 2 (S-2) to capacitor C1 lug 2

(NS). Place a 2-1/4" length of sleeving on the portion of wire between the capacitors.

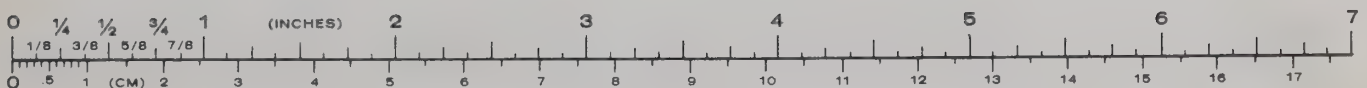
( ) Connect the 10-1/2" wire coming from the large solder lug as shown in Pictorial 11 to capacitor C1 lug 2 (S-2).

( ) Connect the other 6-1/4" wire from bridge rectifier BR1 lug 1 (S-1) through capacitor C2 lug 1 (S-2) to capacitor C1 lug 1 (NS). Place a 2-1/4" length of sleeving on the portion of wire between the capacitors.

( ) Connect the wire coming from Q3 lug C to capacitor C1 lug 1 (S-2).



Detail 11E



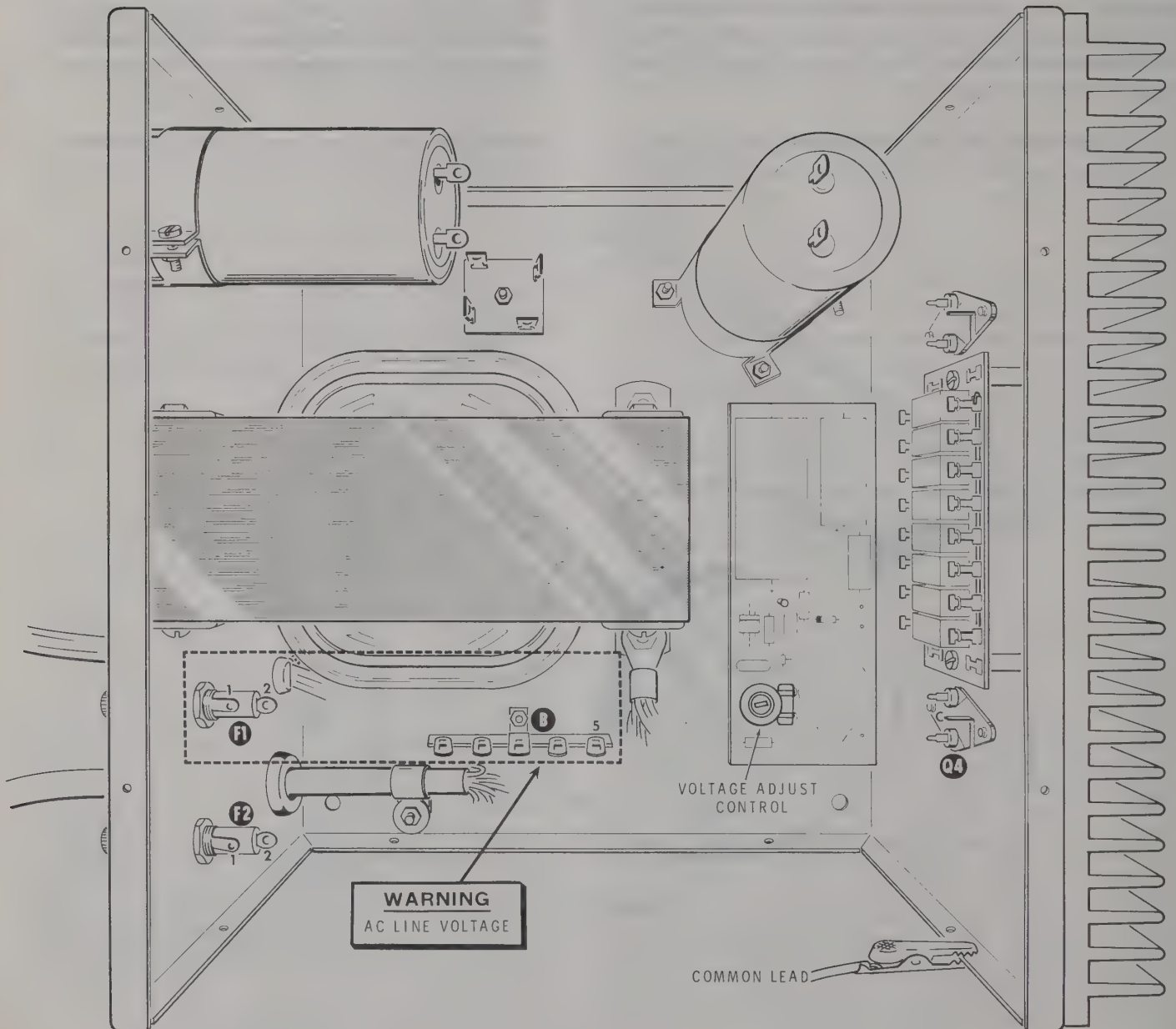


Figure 1



## TEST AND ADJUSTMENT

In the following steps, if you do not obtain the desired results, refer to the "In Case of Difficulty" section and correct the problem before you proceed.

### Resistance Checks

If you have a VOM (or VTVM) available, make the following resistance checks before you plug the line cord into an AC outlet.

- ( ) Connect the common or ground lead of your meter to the Power Supply chassis. Retain this connection for the following "Test and Adjustment" steps.
- ( ) Touch lug C of transistor Q4 with the other meter lead. Be sure a high resistance is indicated between lug C and the chassis.
- ( ) Connect the other meter lead to fuseholder F2 lug 2. You should get a reading of approximately 3000 ohms on RX100 range. Retain this connection for the following step.
- ( ) F2: Install a 20-ampere fuse in fuseholder F2. You should get a reading of approximately 250 ohms.

### Voltage Adjustment

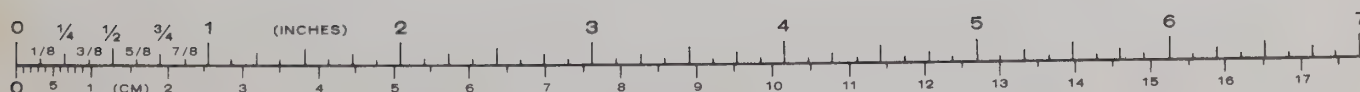
- ( ) Prepare a 5" brown wire.

- ( ) Temporarily solder this wire between fuseholder F1 lug 1 and terminal strip B lug 5.
- ( ) Adjust the VOM to measure DC voltages in the 15-volt range.
- ( ) Connect the positive lead of the VOM to fuseholder F2 lug 2.

**CAUTION:** When the line cord is connected to an AC outlet, AC voltage will be present at several places on the chassis, as shown in Figure 1. Be careful you do not contact this voltage because an electrical shock will result.

- ( ) Plug the line cord into a proper AC outlet. The output should measure between 11 and 15 VDC.
- ( ) Turn the Voltage Adjust control on the circuit board until the meter indicates +13.8 volts DC.
- ( ) UNPLUG THE LINE CORD.
- ( ) Remove the temporary wire from between fuseholder F1, lug 1 and terminal strip B lug 5.

This completes the "Test and Adjustment" section of the Manual. Proceed to "Final Assembly."



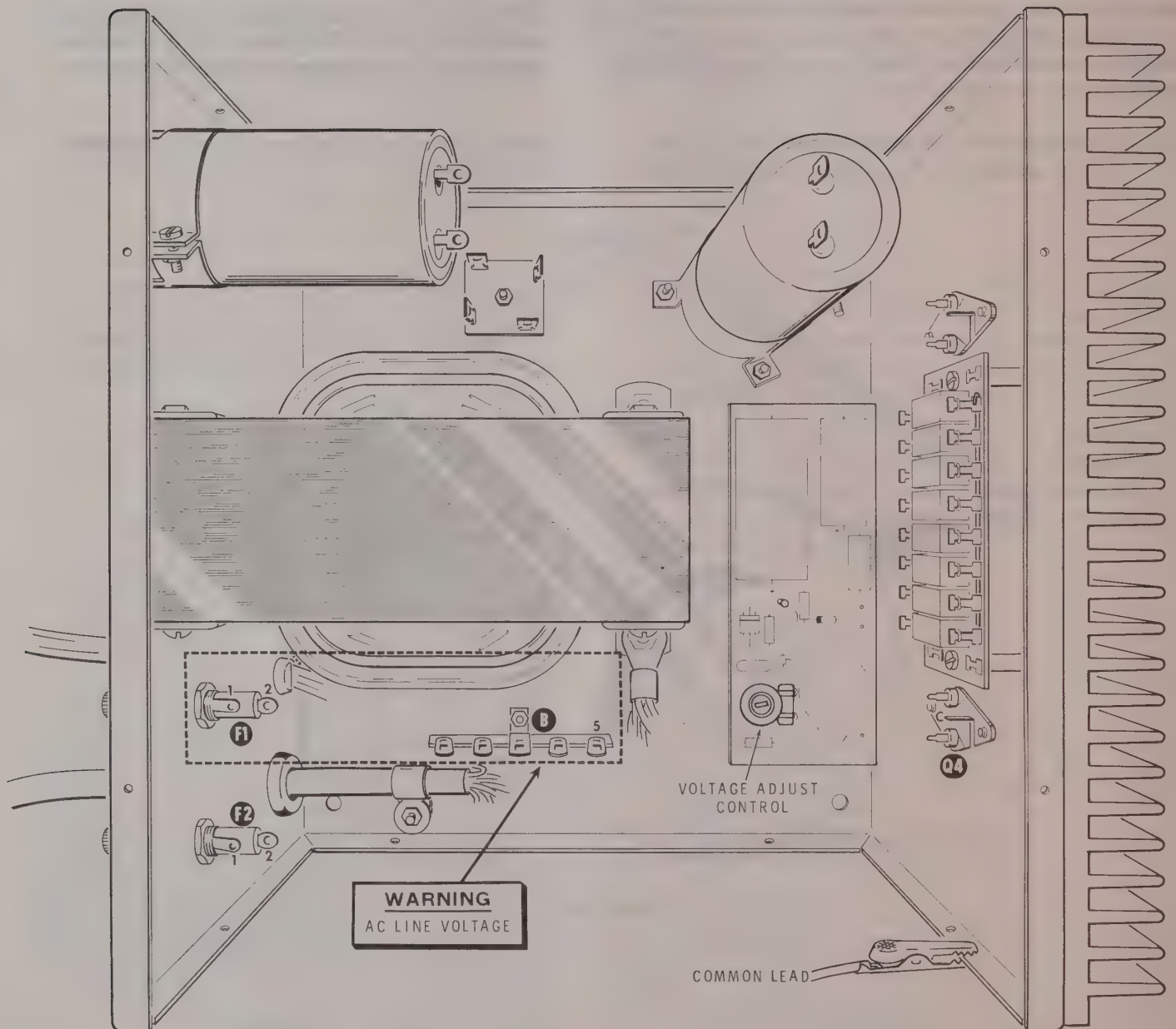


Figure 1



# TEST AND ADJUSTMENT

In the following steps, if you do not obtain the desired results, refer to the "In Case of Difficulty" section and correct the problem before you proceed.

## Resistance Checks

If you have a VOM (or VTVM) available, make the following resistance checks before you plug the line cord into an AC outlet.

- Connect the common or ground lead of your meter to the Power Supply chassis. Retain this connection for the following "Test and Adjustment" steps.
- Touch lug C of transistor Q4 with the other meter lead. Be sure a high resistance is indicated between lug C and the chassis.
- Connect the other meter lead to fuseholder F2 lug 2. You should get a reading of approximately 3000 ohms on RX100 range. Retain this connection for the following step.
- F2: Install a 20-ampere fuse in fuseholder F2. You should get a reading of approximately 250 ohms.

## Voltage Adjustment

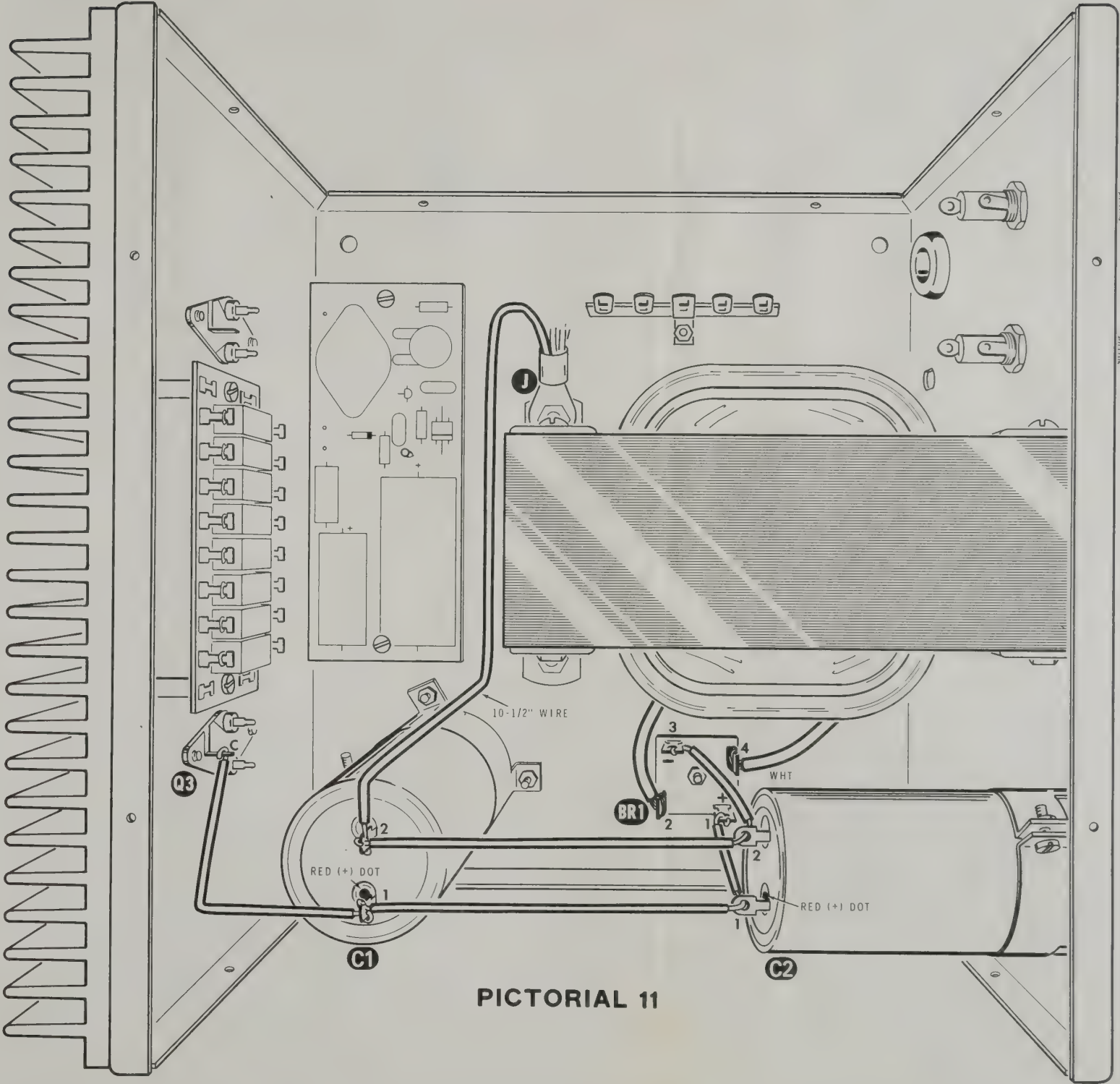
- Prepare a 5" brown wire.

- Temporarily solder this wire between fuseholder F1 lug 1 and terminal strip B lug 5.
- Adjust the VOM to measure DC voltages in the 15-volt range.
- Connect the positive lead of the VOM to fuseholder F2 lug 2.

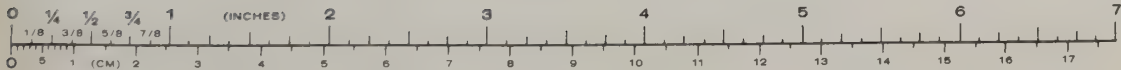
CAUTION: When the line cord is connected to an AC outlet, AC voltage will be present at several places on the chassis, as shown in Figure 1. Be careful you do not contact this voltage because an electrical shock will result.

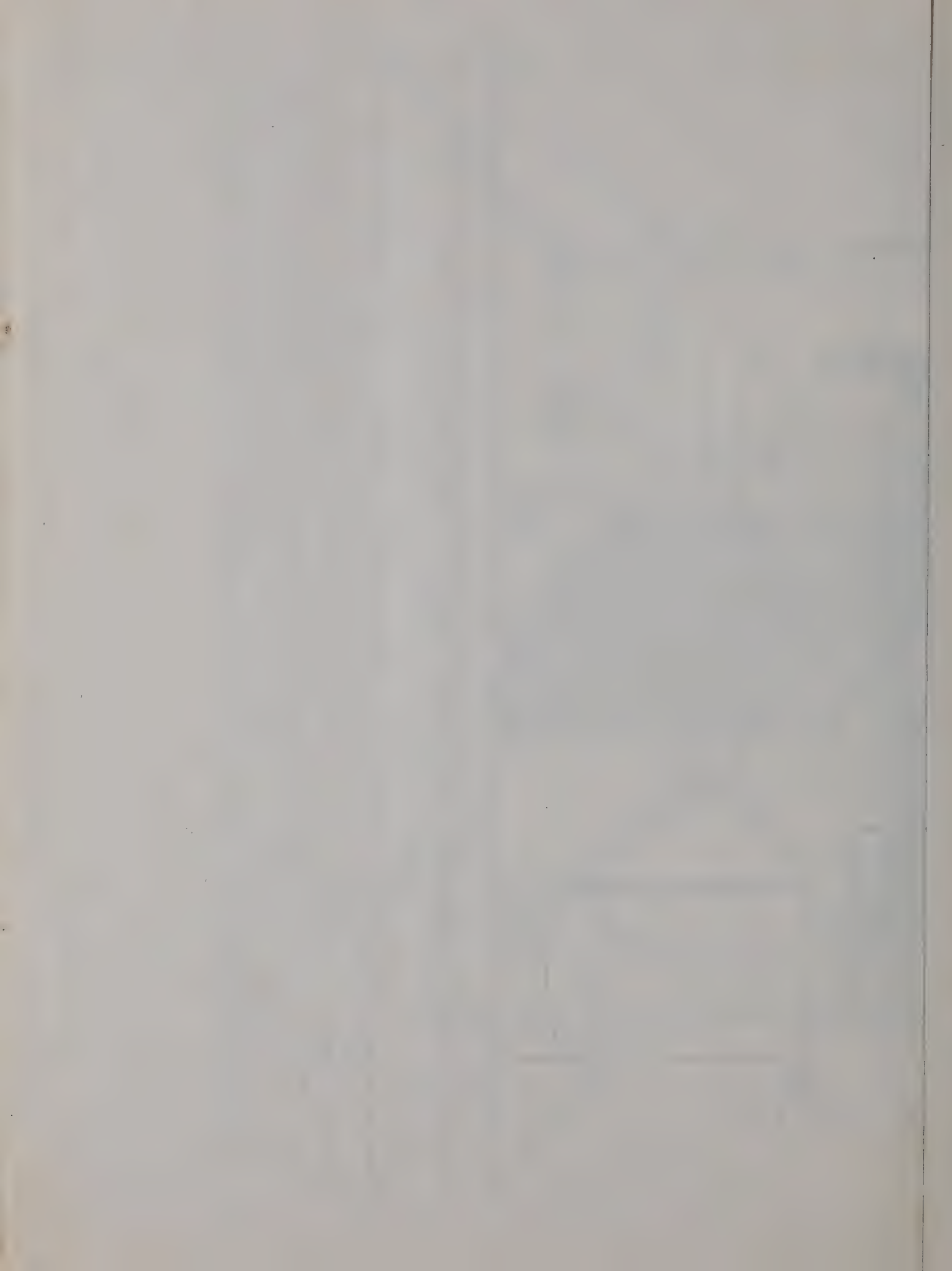
- Plug the line cord into a proper AC outlet. The output should measure between 11 and 15 VDC.
- Turn the Voltage Adjust control on the circuit board until the meter indicates +13.8 volts DC.
- UNPLUG THE LINE CORD.
- Remove the temporary wire from between fuseholder F1, lug 1 and terminal strip B lug 5.

This completes the "Test and Adjustment" section of the Manual. Proceed to "Final Assembly."

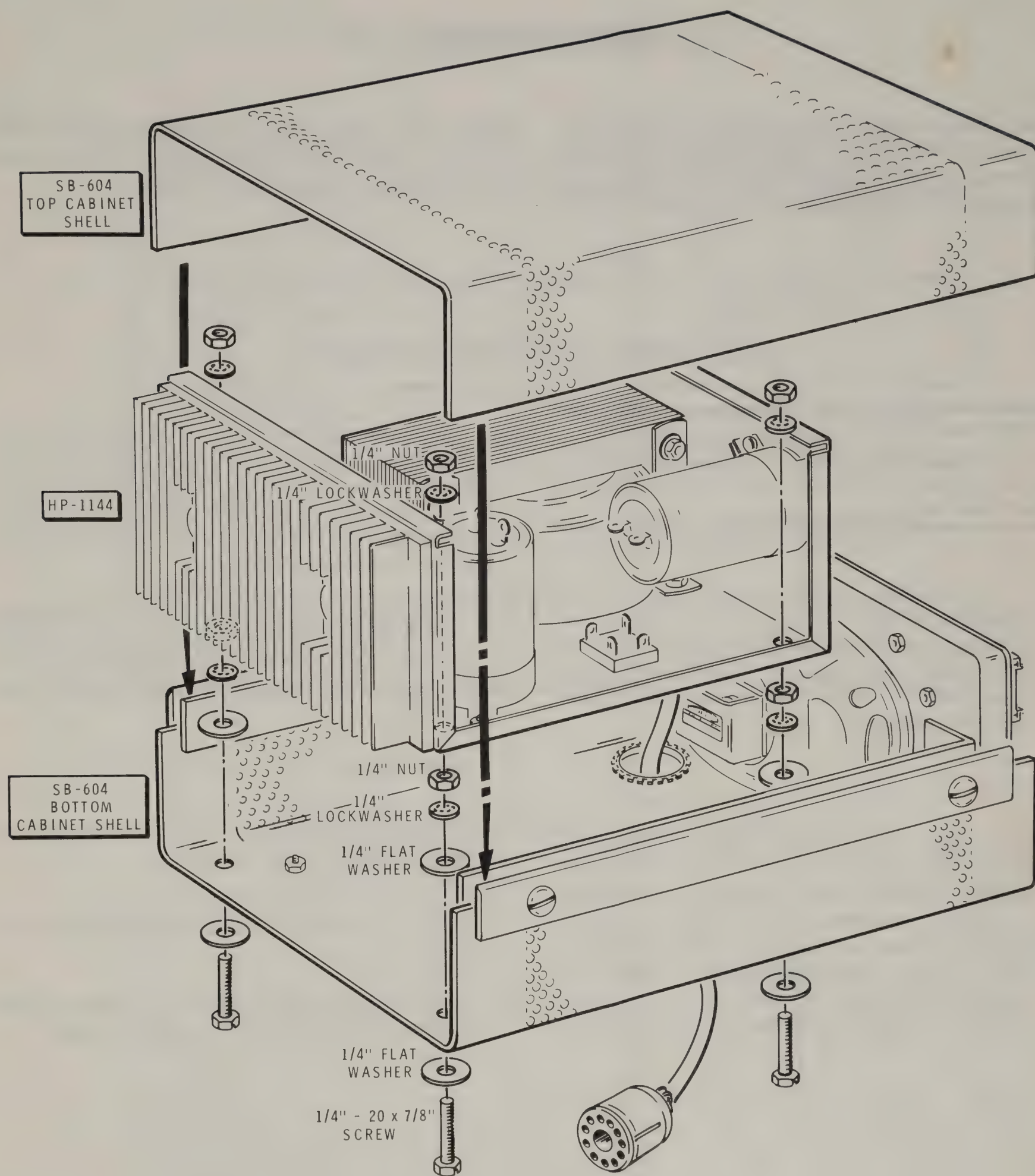


PICTORIAL 11



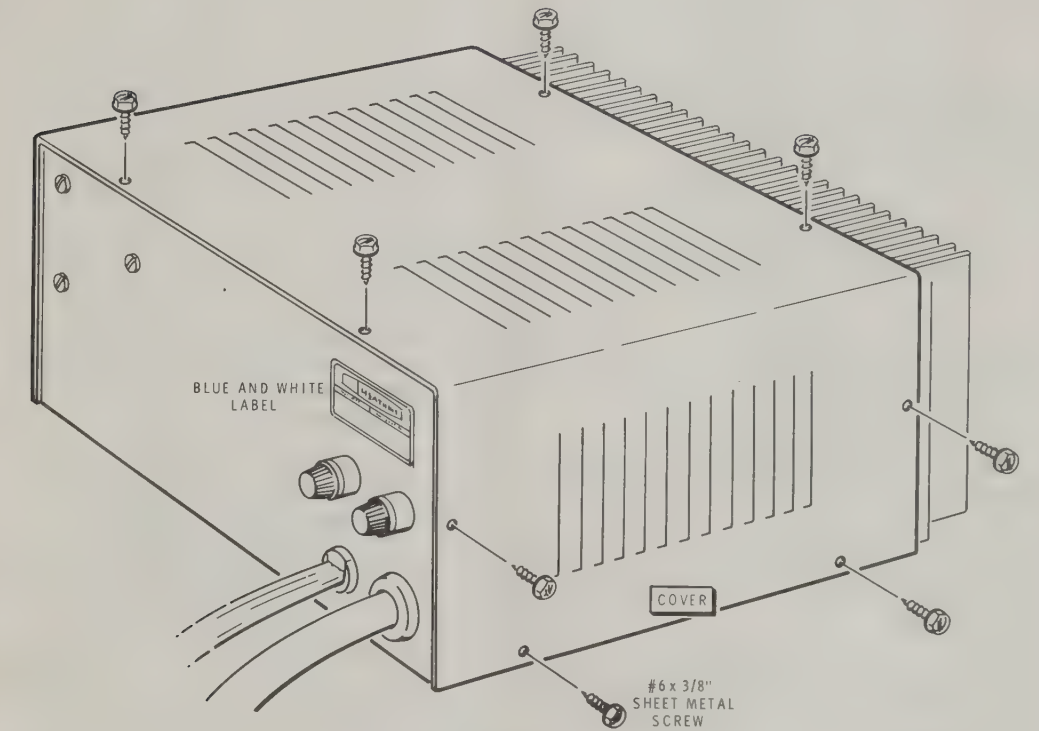






PICTORIAL 12B

## FINAL ASSEMBLY



PICTORIAL 12A

This Power Supply is complete with its own cover, or it can be mounted in the SB-604 speaker cabinet. Since the Power Supply cover reduces air circulation, which results in less efficient cooling, we recommend you use only one of the next two steps.

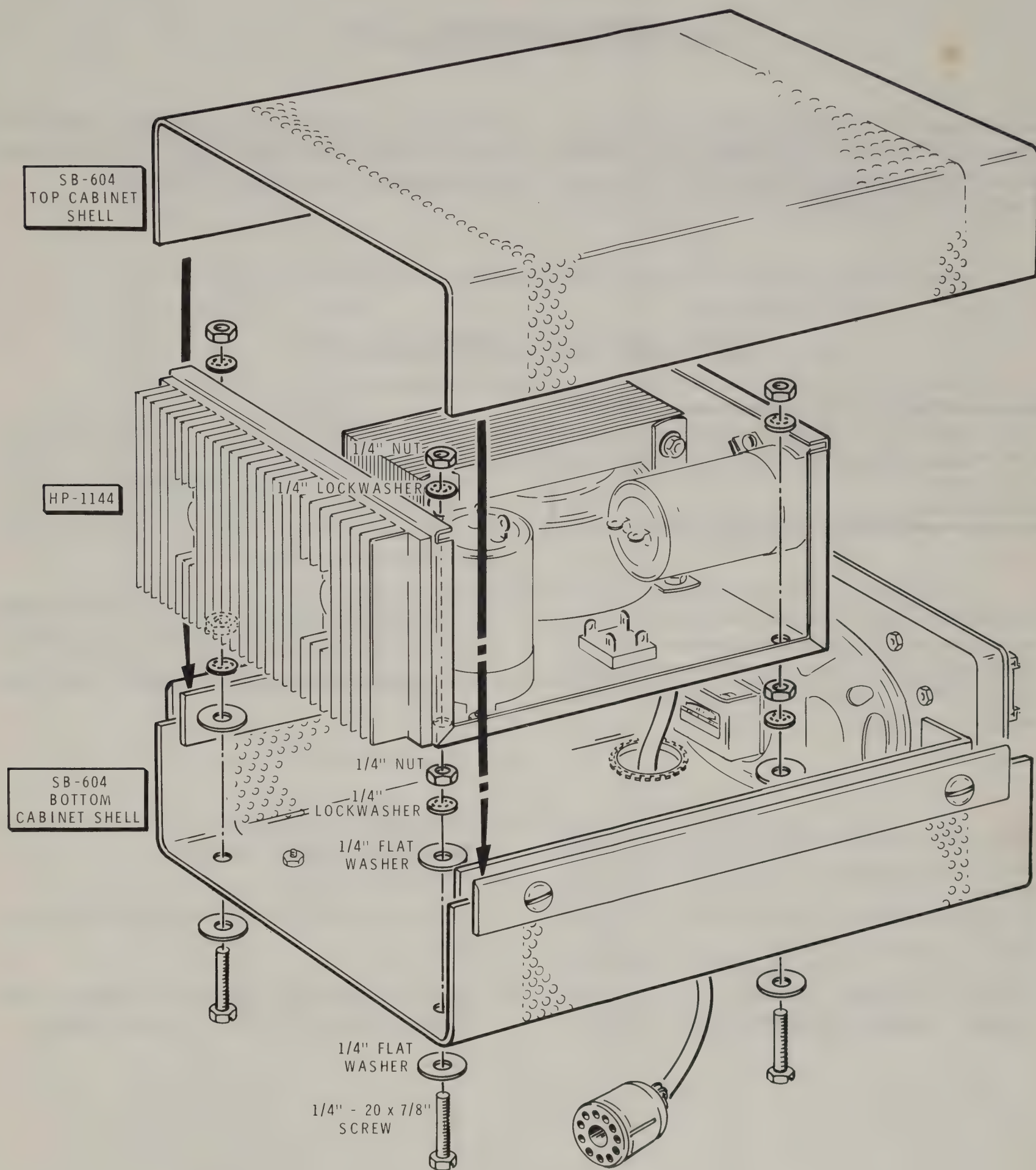
- ( ) Refer to Pictorial 12A and mount the Power Supply cover with twelve #6 x 3/8" sheet metal screws as shown.

- ( ) Refer to Pictorial 12B and mount the Power Supply in the SB-604 speaker cabinet with four 1/4" -20 x 7/8" screws as shown.

- ( ) Carefully peel away the backing paper from the blue and white identification label. Then press the label on the rear of the chassis. Be sure to refer to the numbers on this label in any communications you have with the Heath Company about this kit.

This completes the assembly of your AC Power Supply.





PICTORIAL 12B

## OPERATION

The output voltage can be adjusted between approximately 11 and 16 volts DC, as noted in the "Specifications" section. The recommended value for use with the SB-104 Transceiver is 13.8 volts DC. The operation of the AC Power Supply

consists only of connecting the power cable to the SB-104 and the line cord to the proper AC line. The Power Supply will be switched remotely by the SB-104 switch.

## IN CASE OF DIFFICULTY

**CAUTION:** When the line cord is connected to an AC outlet, AC voltage will be present at several places on the chassis. Be careful you do not contact this voltage or an electrical shock can result.

1. Recheck the wiring. Trace each lead in color pencil on the Pictorial as it is checked. It is frequently helpful to have a friend check your work. Someone who is not familiar with the unit may notice something you have consistently overlooked.
2. About 90% of the kits that are returned for repair do not function properly due to poor connections and soldering. Therefore, many troubles can be eliminated by a careful inspection of connections to make sure they are soldered as described in the "Soldering" section of the "Kit Builders Guide." Reheat any doubtful connections. Be sure all the wires are soldered at places where several wires are connected.
3. Be sure the transistors and the integrated circuit are in the proper locations (correct part number and type number). Be sure that each transistor lead is in the right hole and has a good solder connection. Check the integrated circuit for proper positioning and for good contact at each pin connection.
4. Check capacitor values carefully. Be sure the proper part is wired into the circuit at each capacitor location. Check each electrolytic capacitor to be sure the lead near the positive (+) marking is at the correct position.
5. Check each resistor value carefully.
6. Be sure the correct diode is installed and that the banded end is positioned correctly.
7. Check all component leads connected to the circuit board.
8. Make sure bare wires do not touch the chassis or other lugs and make sure all wires are properly soldered.



## Troubleshooting Chart

PROBLEM	PROBABLE CAUSE
No output voltage.	<ol style="list-style-type: none"><li>1. F1.</li><li>2. F2.</li></ol>
Primary fuse F1 blows.	<ol style="list-style-type: none"><li>1. Bridge rectifier BR1 assembly.</li><li>2. Capacitor C1, C2.</li></ol>
Output fuse F2 blows.	<ol style="list-style-type: none"><li>1. Excessive loading (keydown).</li><li>2. Output shorted.</li></ol>
Unable to obtain +13.8 VDC with Voltage Adjust control.	<ol style="list-style-type: none"><li>1. IC1.</li><li>2. Voltage Adjust control R6.</li><li>3. Resistors R5 or R7.</li><li>4. D5.</li></ol>
Voltage drops significantly when transmitting.	<ol style="list-style-type: none"><li>1. IC1.</li><li>2. Q1, Q2, Q3, or Q4.</li></ol>

In an extreme case where you are unable to resolve a difficulty, refer to the "Customer Service" information inside the rear cover of the Manual. Your Warranty is located inside the front cover.

## SPECIFICATIONS

Output Voltage . . . . .	13.8 VDC regulated. (Adjustable from approximately 11 to 16 VDC.)
Maximum Output Current . . . . .	20 amperes, intermittent, 8 amperes continuous.
Transistor Integrated Circuit and Diode Complement . . . . .	2N3643 transistor. 2N3055 transistor. 40411 pass transistor (2). MFC6030 regulator IC. 1N4002 silicon diode. MDA990-2 bridge rectifier.
Power Requirements . . . . .	110 to 130 VAC, 6 amperes; or 220 to 260 VAC, 3 amperes, 50/60 Hz maximum.
Dimensions . . . . .	5-1/2" high x 9-1/4" wide x 10-1/4" deep.
Regulation . . . . .	Less than 2% from no load to 20 amperes.
Ripple . . . . .	Less than 1% at 20 amperes.
Fuses . . . . .	7-amp, 3AG, slow-blow primary. 20-amp, 3AG, output.
Net Weight . . . . .	23 lbs. (10.4Kg).

---

The Heath Company reserves the right to discontinue products and to change specifications at any time without incurring any obligation to incorporate new features in products previously sold.



## CIRCUIT DESCRIPTION

Refer to the Schematic Diagram (fold-out from Page 31) as you read the following description.

The 120 VAC (or 240 VAC) line voltage is applied through primary fuse F1 and the power on-off switch (remote SB-104 switch) to the primary winding of power transformer T1. From the secondary winding, the voltage is applied to BR1 — a full wave bridge rectifier circuit. The rectified DC is then filtered by electrolytic capacitors C1 and C2, and applied to the regulator circuitry.

Transistors Q1 and Q2, with Q3 and Q4 form a triple Darlington circuit with exceptionally high gain for good regulation. Transistors Q3 and Q4 are paralleled in a series regulator circuit. The conduction of the Darlington circuit and the output voltage is controlled by the base bias provided by integrated circuit IC1. IC1 with its own zener reference diode, samples the output voltage, compares this to the internal reference voltage, and automatically adjusts the base bias of Q1 as needed to maintain a fixed output level. The output voltage is sampled at the load end of the

power cable, thereby compensating for the voltage drop across fuse F2 and the power cable. This allows almost no change in load voltage from no load to full load conditions.

The regulated output voltage level is adjusted by VOLTAGE ADJUST control R6.

Capacitor C3 provides a nearly pure DC voltage for the integrated circuit regulator, IC1. Diode D5 allows C3 to charge from the power path but does not allow it to discharge back. In this way only the small load of IC1 is placed on C3. R1 prevents excessive current from flowing through D5 when the power supply is turned on.

Resistors R2 and R3 balance the current between the two regulator transistors, Q3 and Q4. Fuse F2 protects the regulators against an overload, and resistor R4 is a bleeder resistor and capacitor C5 provides transient protection for the supply.

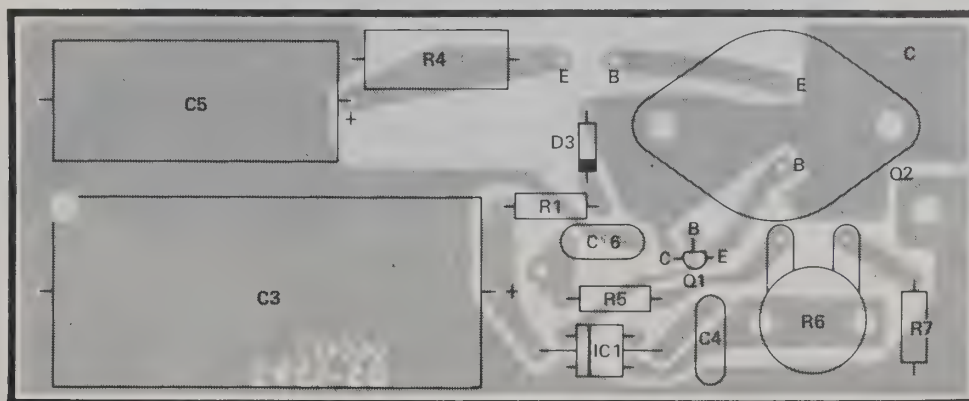
## CIRCUIT BOARD X-RAY VIEW

NOTE: To find the PART NUMBER of a component for the purpose of ordering a replacement part:

A. Find the circuit component number (R5, C3, etc.) on the "X-Ray View" or "Chassis Photograph."

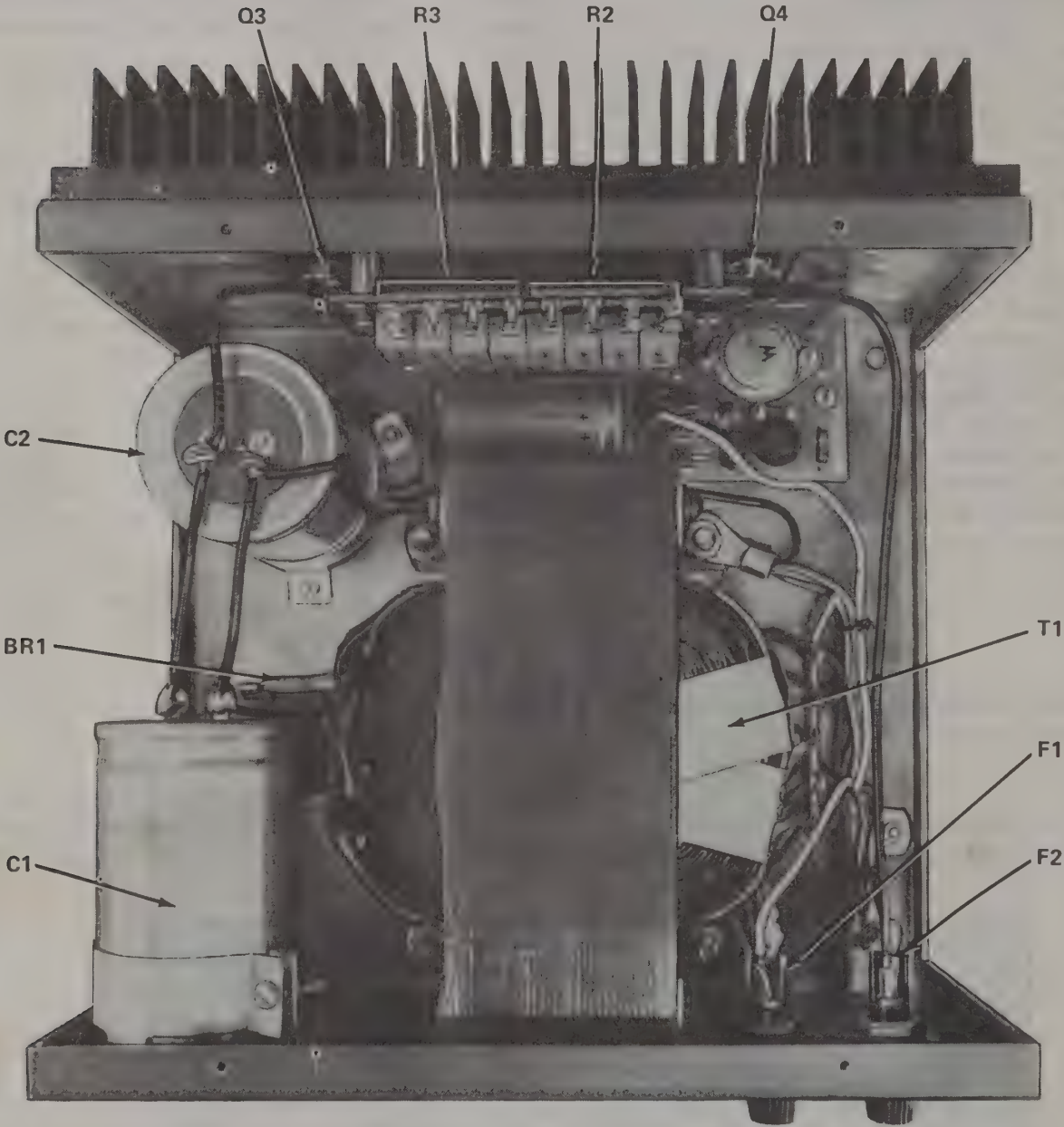
B. Locate this same number in the "Circuit Component Number" column of the "Parts List."

C. Adjacent to the circuit component number, you will find the PART NUMBER and DESCRIPTION which must be supplied when you order a replacement part.



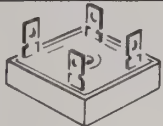

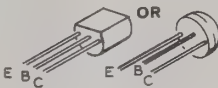

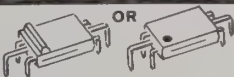
(Viewed from component side)

CHASSIS PHOTOGRAPH

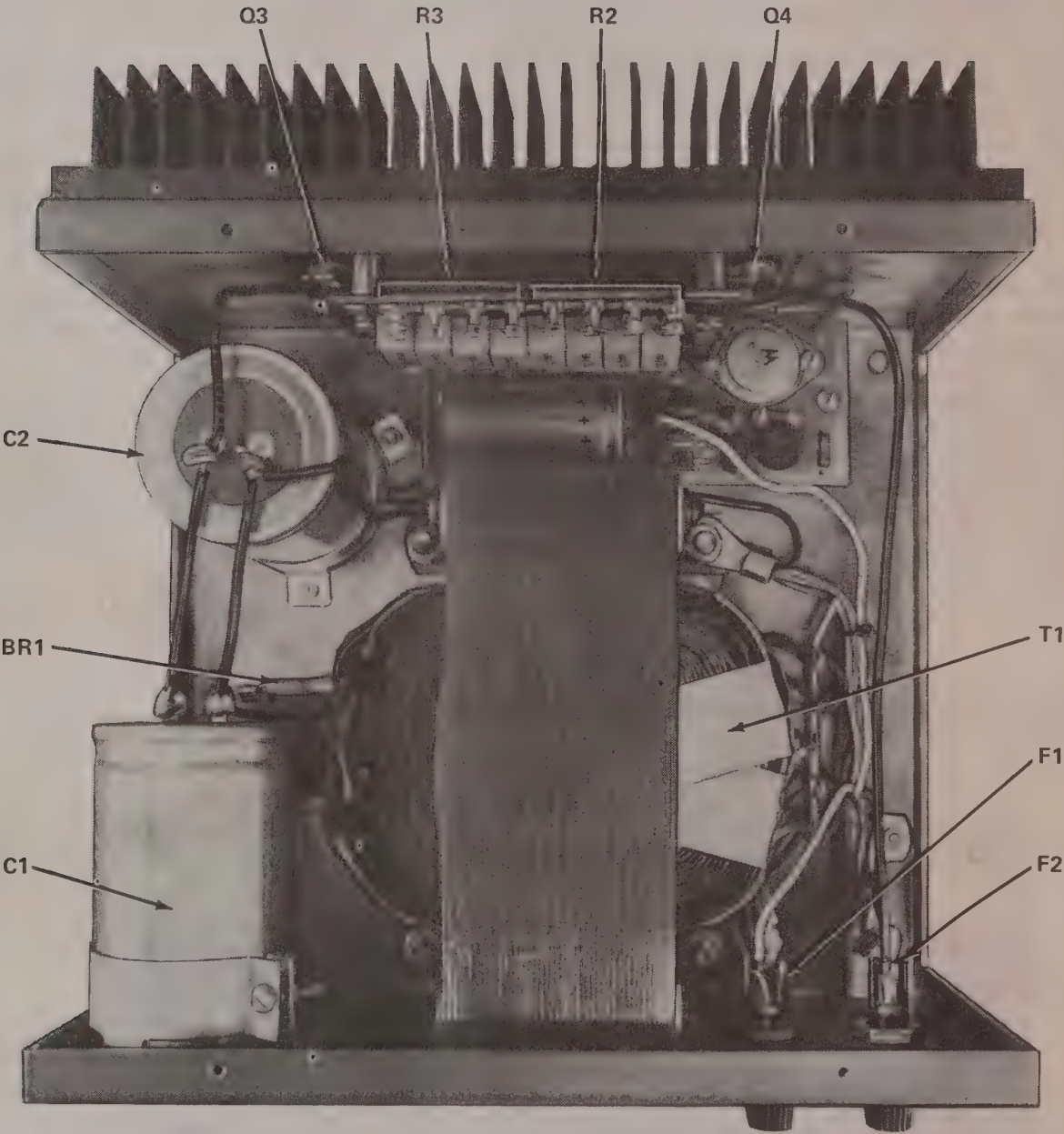




# SEMICONDUCTOR IDENTIFICATION CHART


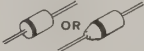


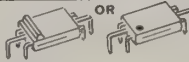
COMPONENT NUMBER	HEATH PART NUMBER	REPLACED BY	DESCRIPTION
BR1	57-88	MDA990-2	BRIDGE RECTIFIER 
D5	57-65	1N4002	DIODE 
Q1	417-233	2N3643	TRANSISTOR 
Q2	417-215	2N3055	TRANSISTOR
Q3	417-139	40411	TRANSISTOR
Q4	417-139	40411	TRANSISTOR 
IC1	442-48	MFC6030	INTEGRATED CIRCUIT 

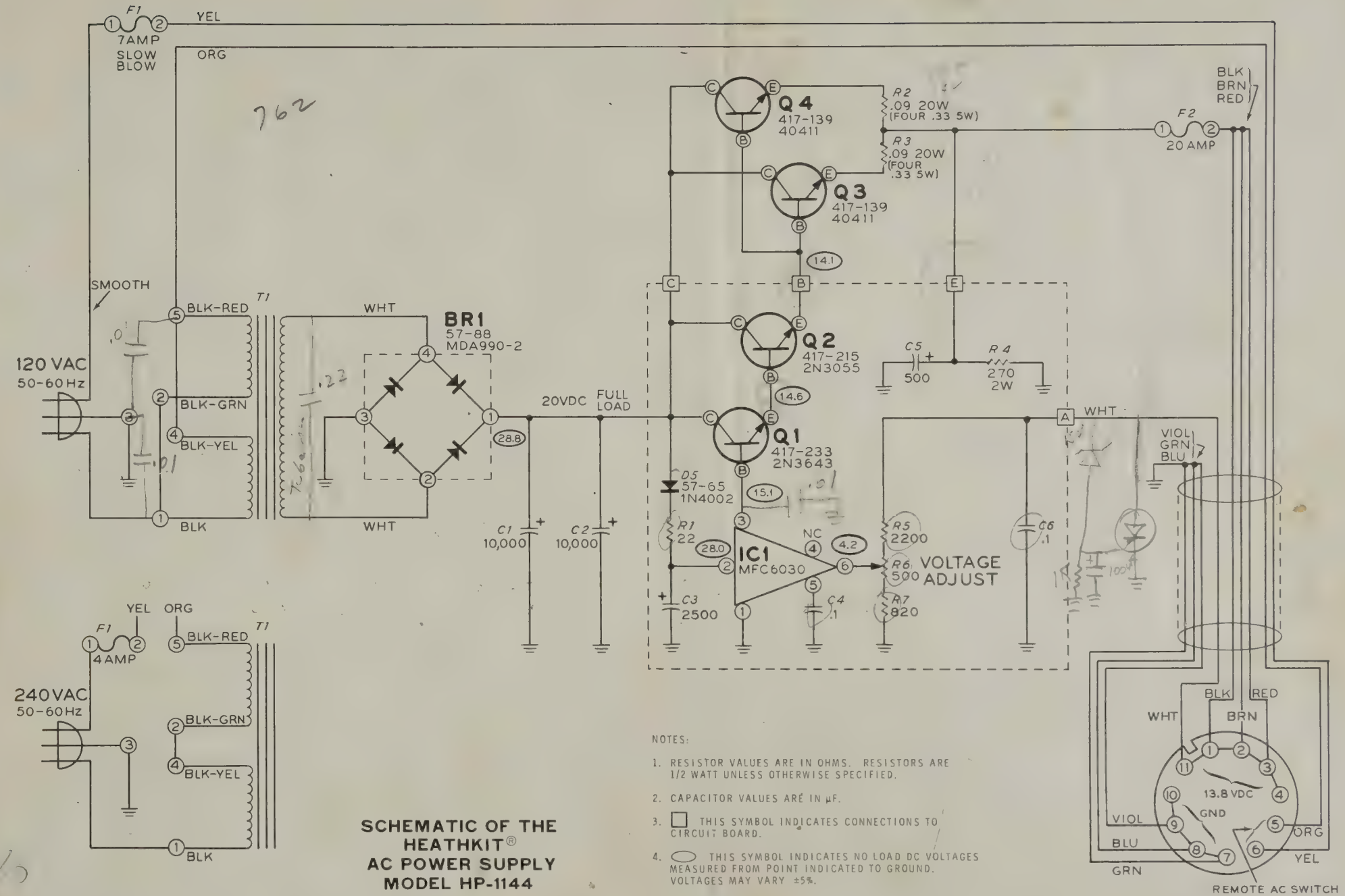
CHASSIS PHOTOGRAPH





## SEMICONDUCTOR IDENTIFICATION CHART

COMPONENT NUMBER	HEATH PART NUMBER	REPLACED BY	DESCRIPTION
BR1	57-88	MDA990-2	BRIDGE RECTIFIER 
D5	57-65	1N4002	DIODE 
Q1	417-233	2N3643	TRANSISTOR 
Q2	417-215	2N3055	TRANSISTOR
Q3	417-139	40411	TRANSISTOR
Q4	417-139	40411	TRANSISTOR 
IC1	442-48	MFC6030	INTEGRATED CIRCUIT 







# CUSTOMER SERVICE

## REPLACEMENT PARTS

If you need a replacement part, please fill in the Parts Order Form that is furnished and mail it to the Heath Company. Or, if you write a letter, include the:

- Part number and description as shown in the Parts List.
- Model number and Series number from the blue and white label.
- Date of purchase.
- Nature of the defect.

**Please do not return parts** to the factory unless they are requested. Parts that are damaged through carelessness or misuse by the kit builder will not be replaced without cost, and will not be considered in warranty.

Parts are also available at the Heathkit Electronic Centers listed in your catalog. Be sure to provide the Heath part number. Bring in the original part when you request a warranty replacement from a Heathkit Electronic Center.

NOTE: Replacement parts are maintained specifically to repair Heathkit products. Parts sales for other reasons will be declined.

## TECHNICAL CONSULTATION

Need help with your kit? . . . . Self-Service? . . . . Construction? . . . . Operation? . . . . Call or write for assistance. You'll find our Technical Consultants eager to help with just about any technical problem except "customizing" for unique applications.

The effectiveness of our consultation service depends on the information you furnish. Be sure to tell us:

- The Model number and Series number from the blue and white label.
- The date of purchase.
- An exact description of the difficulty.
- Everything you have done in attempting to correct the problem.

Also include switch positions, connections to other units, operating procedures, voltage readings, and any other information you think might be helpful.

**Please do not send parts for testing**, unless this is specifically requested by our Consultants.

Hints: Telephone traffic is lightest at midweek. . . please be sure your Manual and notes are on hand when you call.

Heathkit Electronic Center facilities are also available for telephone or "walk-in" personal assistance.

## REPAIR SERVICE

Service facilities are available, if they are needed, to repair your completed kit. (Kits that have been modified, soldered with paste flux or acid core solder, cannot be accepted for repair.)

**If it is convenient, personally deliver your kit to a Heathkit Electronic Center. For warranty parts replacement, supply a copy of the invoice or sales slip.**

If you prefer to ship your kit to the factory, attach a letter containing the following information directly to the unit:

- Your name and address.
- Date of purchase.
- Copies of all correspondence relevant to the service of the kit.
- A brief description of the difficulty.
- Authorization to return your kit C.O.D. for the service and shipping charges. (This will reduce the possibility of delay.)

Check the equipment to see that all screws and parts are secured. (Do not include any wooden cabinets or color television picture tubes, as these are easily damaged in shipment.) Place the equipment in a strong carton with at least **THREE INCHES** of *resilient* packing material (shredded paper, excelsior, etc.) on all sides. Use additional packing material where there are protrusions (control sticks, large knobs, etc.). If the unit weighs over 15 lbs., place this carton in another one with 3/4" of packing material between the two.

Seal the carton with reinforced gummed tape, tie it with a strong cord, and mark it "Fragile" on at least two sides. Remember, the carrier will not accept liability for shipping damage if the unit is insufficiently packed. Ship by prepaid express, United Parcel Service, or insured Parcel Post to:

Heath Company  
Service Department  
Benton Harbor, Michigan 49022

HEATH

Schlumberger

HEATH COMPANY • BENTON HARBOR, MICHIGAN  
***THE WORLD'S FINEST ELECTRONIC EQUIPMENT IN KIT FORM***

LITHO IN U.S.A.

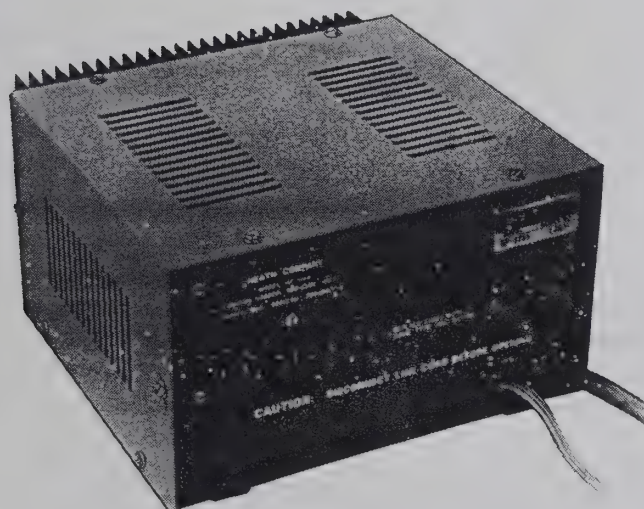


# Assembly and Operation of the



## AC POWER SUPPLY

MODEL HP-1144



CONDENSED

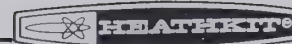
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HEATH COMPANY  
BENTON HARBOR, MICHIGAN 49022







## INTRODUCTION

The Heathkit Model HP-1144 AC Power Supply provides well-regulated, low voltage, DC power from an AC power source. You can wire it to operate from either a 120-volt AC or 240-volt AC 50/60 Hz power line and maintain regulation within 2%.

This AC Power Supply was primarily designed to provide +13.8 VDC for the Heathkit, Model SB-104 SSB Transceiver. A cable and socket provide output power and a series connection for the remote on-off switch on the Transceiver.

The attractive, rugged construction and reliable performance of this Power Supply will provide many years of dependable service.

Refer to the "Kit Builders Guide" for complete information on unpacking, parts identification, tools, wiring, soldering, and step-by-step assembly procedures.

## PARTS LIST

Check each part against the following list. The parts may vary slightly from the illustration. Keep any part that is individually packaged with a part number on it in its package after you identify it until you actually use it. Some parts are marked with a "171-" packaging number. These numbers are used for packaging only and do not appear in the Manual "Parts List." Save all packaging material until you locate all the parts.

Each circuit part in this kit has its own circuit component number (R2, C4, etc.). Use these numbers when you want to positively identify the same part in the various sections of the Manual. These numbers, which are especially useful when a part has to be replaced, appear:

- In the Parts List,
- At the beginning of each step where a component is installed,
- In some illustrations,
- In the Schematic,
- In the sections at the rear of the Manual.

To order a replacement part use the Parts Order Form furnished with this kit. If a Parts Order Form is not available, refer to "Replacement Parts" inside the rear cover of this Manual. NOTE: Never use a "171-" packaging number if you must order replacement parts; use only the part numbers listed in the following list.

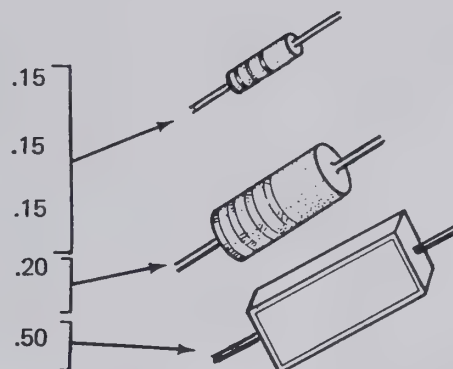




QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.	PRICE Each
------	-------------	-------------	--------------------------	---------------

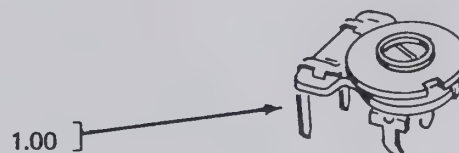
## RESISTORS

( )	1	22 $\Omega$ (red-red-black), 1/2-watt	1-49	R1	.15
( )	1	820 $\Omega$ (gray-red-brown), 1/2-watt	1-8	R7	.15
( )	1	2200 $\Omega$ (red-red-red), 1/2-watt	1-44	R5	.15
( )	1	270 $\Omega$ (red-violet-brown), 2-watt	1-30-2	R4	.20
( )	8	.33 $\Omega$ , 5-watt	3-11-5	R2, R3 (4 each)	.50



## CONTROL

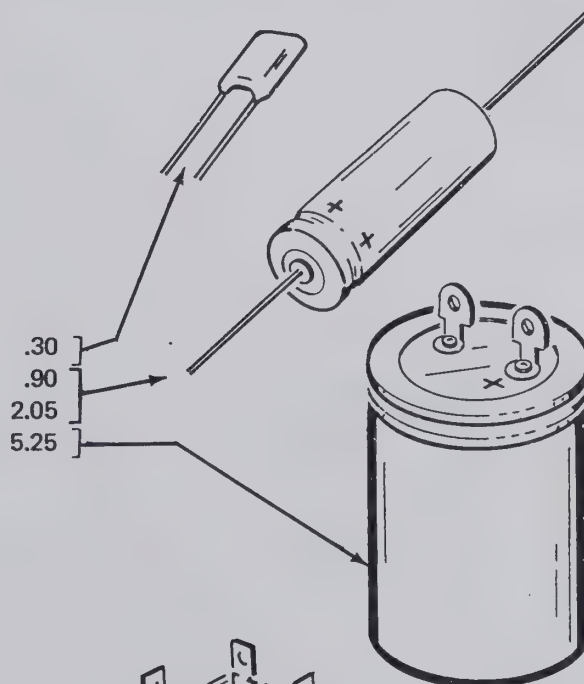
( )	1	500 $\Omega$	10-381	R6	1.00
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## CAPACITORS

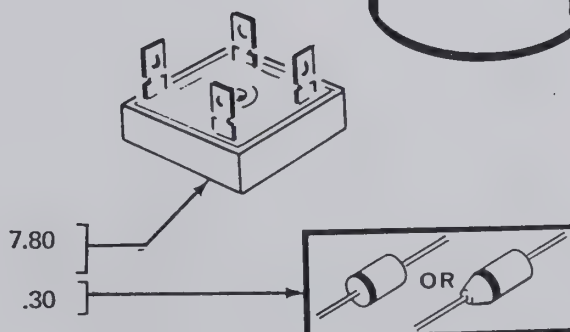
NOTE: Mylar capacitors can be marked three different ways. EXAMPLE: .1, .1k, or .1  $\mu$ F. However, the parts list and installation instructions will always use  $\mu$ F.

( )	2	.1 $\mu$ F Mylar*	27-47	C4, C6	.30
( )	1	500 $\mu$ F electrolytic	25-199	C5	.90
( )	1	2500 $\mu$ F electrolytic	25-154	C3	2.05
( )	2	10,000 $\mu$ F electrolytic	25-263	C1, C2	5.25



## DIODES-TRANSISTORS

( )	1	MDA990-2 bridge rectifier	57-88	BR1	7.80
( )	1	1N4002 diode	57-65	D5	.30



\*DuPont Registered Trademark





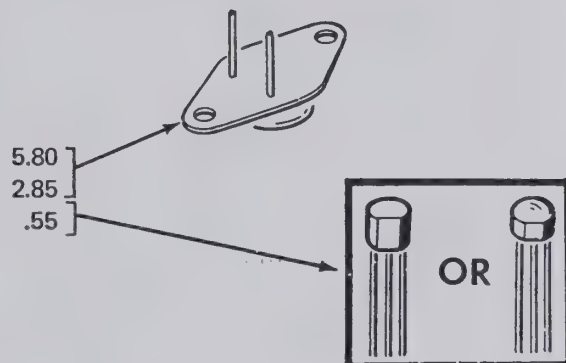
QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.	PRICE Each
------	-------------	-------------	--------------------------	---------------

### Diodes-Transistors (cont'd.)

NOTE: Transistors are marked for identification in one of the following four ways. (The term "type number" refers only to the numbers in a transistor or integrated circuit description. It does not refer to the letters, which could change.)

1. Part number.
2. Transistor or integrated circuit type number.
3. Part number and type number.
4. Part number with a type other than the one listed.

( )	2	40411 transistor	417-139	Q3, Q4
( )	1	2N3055 transistor	417-215	Q2
( )	1	2N3643 transistor	417-233	Q1



### INTEGRATED CIRCUIT

NOTE: If either the "Part Number" or the "Description" number is on the integrated circuit, you have the correct part. Do not be concerned about any other numbers. (The Description number may have additional letters and numbers other than those given.)

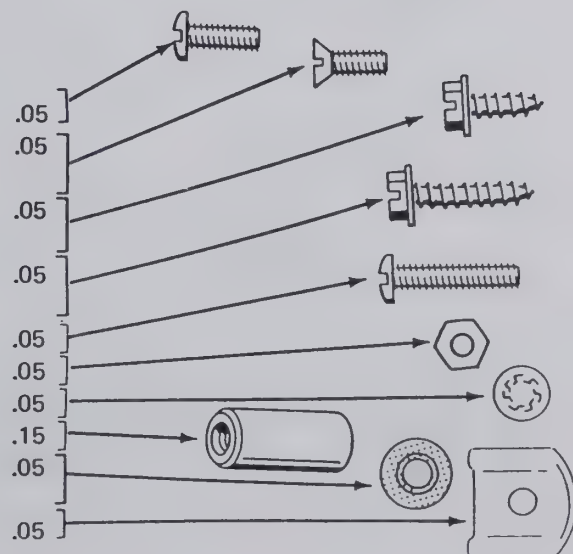
( )	1	MFC 6030 integrated circuit	442-48	IC1
-----	---	-----------------------------	--------	-----



### HARDWARE

#### #6 Hardware

( )	16	6-32 x 3/8" screw	250-89
( )	2	6-32 x 3/8" flat head screw	250-434
( )	12	#6 x 3/8" sheet metal screw	250-475
( )	4	#6 x 5/8" sheet metal screw	250-1199
( )	7	6-32 x 11/16" screw	250-206
( )	13	6-32 nut	252-3
( )	22	#6 lockwasher	254-1
( )	4	6-32 x 11/16" spacer	255-83
( )	6	#6 fiber shoulder washer	253-2
( )	1	#6 D washer	253-89







QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.	PRICE Each
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### Hardware (cont'd.)

#### 1/4" Hardware

( )	8	1/4"-20 x 7/8" screw	250-253
( )	13	1/4" nut	252-57
( )	9	1/4" flat washer	253-31
( )	14	1/4" lockwasher	254-14
( )	1	Large solder lug	259-23

### METAL PARTS

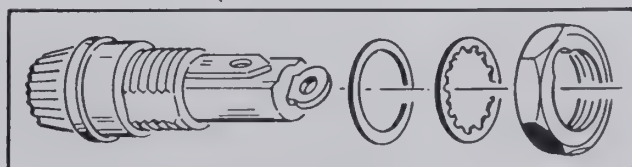
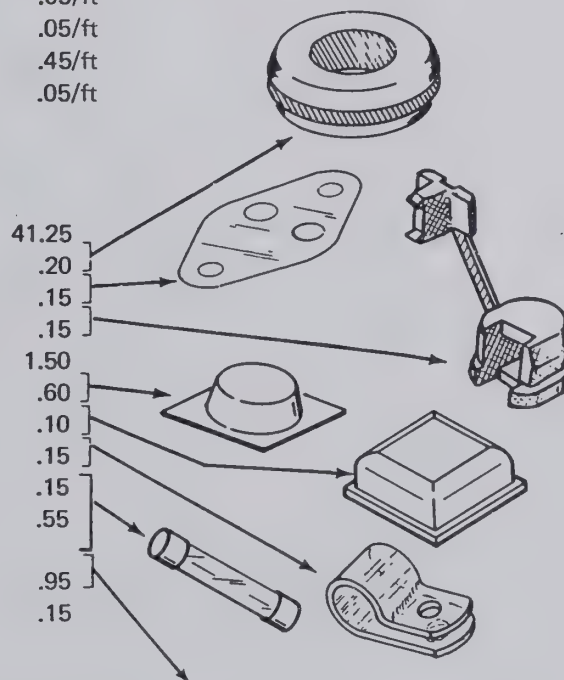
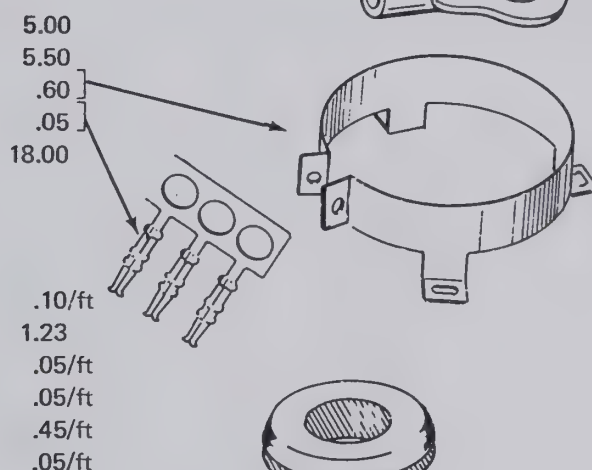
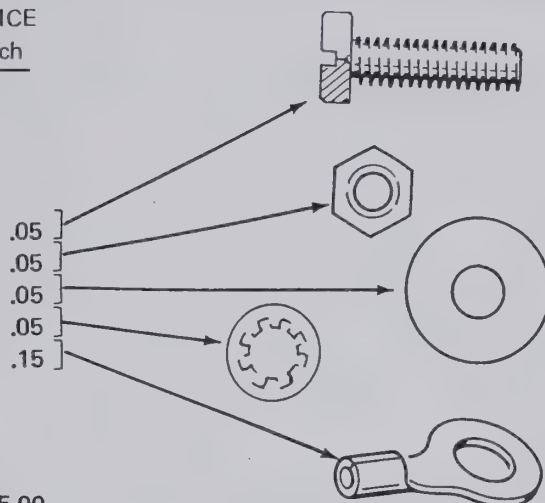
( )	1	Cover	90-1108-1
( )	1	Chassis	200-678-1
( )	2	Clamp	207-2
( )	1	Connector pin	259-20
( )	1	Heat sink	215-76

### WIRE-SLEEVE

( )	1	Large sleeving	346-4
( )	1	Line cord	89-23
( )	1	Brown wire #18	344-31
( )	1	Small sleeving	346-7
( )	1	Cable (9 wire)	347-40
( )	1	Bare wire	340-1

### MISCELLANEOUS

( )	1	Transformer	54-848	T1
( )	1	Grommet	73-23	
( )	2	Mica insulator	75-44	
( )	1	Strain relief	75-71	
( )	1	Printed circuit board	85-1392-1	
( )	1	Thermal grease	352-31	
( )	4	Plastic foot	261-34	
( )	1	Cable clamp	207-18	
( )	1	20-amp fuse, 3AG, SFE	421-18	F2
( )	1	7-amp fuse, 3AG, MDX7 slow-blow	421-9	F1
( )	2	Fuseholder	423-1	
( )	1	Nut starter	490-5	







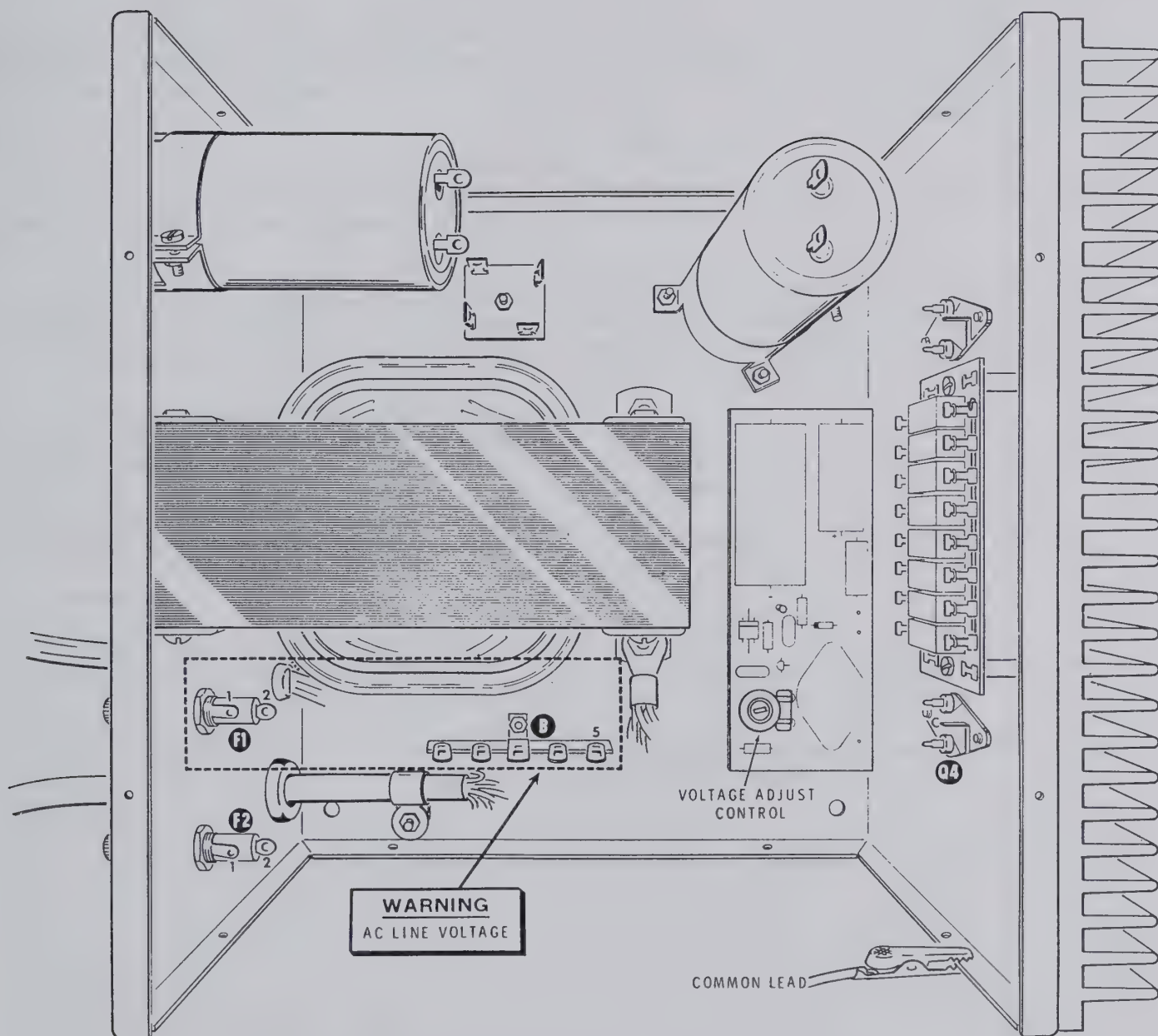


Figure 1



## TEST AND ADJUSTMENT

In the following steps, if you do not obtain the desired results, refer to the "In Case of Difficulty" section and correct the problem before you proceed.

### Resistance Checks

If you have a VOM (or VTVM) available, make the following resistance checks before you plug the line cord into an AC outlet.

- ( ) Connect the common or ground lead of your meter to the Power Supply chassis. Retain this connection for the following "Test and Adjustment" steps.
- ( ) Touch lug C of transistor Q4 with the other meter lead. Be sure a high resistance is indicated between lug C and the chassis.
- ( ) Connect the other meter lead to fuseholder F2 lug 2. You should get a reading of approximately 3000 ohms on RX100 range. Retain this connection for the following step.
- ( ) F2: Install a 20-ampere fuse in fuseholder F2. You should get a reading of approximately 250 ohms.

### Voltage Adjustment

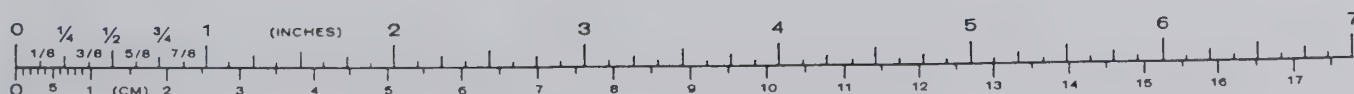
- ( ) Prepare a 5" brown wire.

- ( ) Temporarily solder this wire between fuseholder F1 lug 1 and terminal strip B lug 5.
- ( ) Adjust the VOM to measure DC voltages in the 15-volt range.
- ( ) Connect the positive lead of the VOM to fuseholder F2 lug 2.

**CAUTION:** When the line cord is connected to an AC outlet, AC voltage will be present at several places on the chassis, as shown in Figure 1. Be careful you do not contact this voltage because an electrical shock will result.

- ( ) Plug the line cord into a proper AC outlet. The output should measure between 11 and 15 VDC.
- ( ) Turn the Voltage Adjust control on the circuit board until the meter indicates +13.8 volts DC.
- ( ) UNPLUG THE LINE CORD.
- ( ) Remove the temporary wire from between fuseholder F1, lug 1 and terminal strip B lug 5.

This completes the "Test and Adjustment" section of the Manual. Proceed to "Final Assembly."







## OPERATION

The output voltage can be adjusted between approximately 11 and 16 volts DC, as noted in the "Specifications" section. The recommended value for use with the SB-104 Transceiver is 13.8 volts DC. The operation of the AC Power Supply

consists only of connecting the power cable to the SB-104 and the line cord to the proper AC line. The Power Supply will be switched remotely by the SB-104 switch.

## IN CASE OF DIFFICULTY

**CAUTION:** When the line cord is connected to an AC outlet, AC voltage will be present at several places on the chassis. Be careful you do not contact this voltage or an electrical shock can result.

1. Recheck the wiring. Trace each lead in color pencil on the Pictorial as it is checked. It is frequently helpful to have a friend check your work. Someone who is not familiar with the unit may notice something you have consistently overlooked.
2. About 90% of the kits that are returned for repair do not function properly due to poor connections and soldering. Therefore, many troubles can be eliminated by a careful inspection of connections to make sure they are soldered as described in the "Soldering" section of the "Kit Builders Guide." Reheat any doubtful connections. Be sure all the wires are soldered at places where several wires are connected.
3. Be sure the transistors and the integrated circuit are in the proper locations (correct part number and type number). Be sure that each transistor lead is in the right hole and has a good solder connection. Check the integrated circuit for proper positioning and for good contact at each pin connection.
4. Check capacitor values carefully. Be sure the proper part is wired into the circuit at each capacitor location. Check each electrolytic capacitor to be sure the lead near the positive (+) marking is at the correct position.
5. Check each resistor value carefully.
6. Be sure the correct diode is installed and that the banded end is positioned correctly.
7. Check all component leads connected to the circuit board.
8. Make sure bare wires do not touch the chassis or other lugs and make sure all wires are properly soldered.



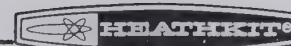


## Troubleshooting Chart

PROBLEM	PROBABLE CAUSE
No output voltage.	<ol style="list-style-type: none"><li>1. F1.</li><li>2. F2.</li></ol>
Primary fuse F1 blows.	<ol style="list-style-type: none"><li>1. Bridge rectifier BR1 assembly.</li><li>2. Capacitor C1, C2.</li></ol>
Output fuse F2 blows.	<ol style="list-style-type: none"><li>1. Excessive loading (keydown).</li><li>2. Output shorted.</li></ol>
Unable to obtain +13.8 VDC with Voltage Adjust control.	<ol style="list-style-type: none"><li>1. IC1.</li><li>2. Voltage Adjust control R6.</li><li>3. Resistors R5 or R7.</li><li>4. D5.</li></ol>
Voltage drops significantly when transmitting.	<ol style="list-style-type: none"><li>1. IC1.</li><li>2. Q1, Q2, Q3, or Q4.</li></ol>

In an extreme case where you are unable to resolve a difficulty, refer to the "Customer Service" information inside the rear cover of the Manual. Your Warranty is located inside the front cover.





## SPECIFICATIONS

Output Voltage . . . . .	13.8 VDC regulated. (Adjustable from approximately 11 to 16 VDC.)
Maximum Output Current . . . . .	20 amperes, intermittent, 8 amperes continuous.
Transistor Integrated Circuit and Diode Complement . . . . .	2N3643 transistor. 2N3055 transistor. 40411 pass transistor (2). MFC6030 regulator IC. 1N4002 silicon diode. MDA990-2 bridge rectifier.
Power Requirements . . . . .	110 to 130 VAC, 6 amperes; or 220 to 260 VAC, 3 amperes, 50/60 Hz maximum.
Dimensions . . . . .	5-1/2" high x 9-1/4" wide x 10-1/4" deep.
Regulation . . . . .	Less than 2% from no load to 20 amperes.
Ripple . . . . .	Less than 1% at 20 amperes.
Fuses . . . . .	7-amp, 3AG, slow-blow primary. 20-amp, 3AG, output.
Net Weight . . . . .	23 lbs. (10.4Kg).

---

The Heath Company reserves the right to discontinue products and to change specifications at any time without incurring any obligation to incorporate new features in products previously sold.





## CIRCUIT DESCRIPTION

Refer to the Schematic Diagram (fold-out from Page 31) as you read the following description.

The 120 VAC (or 240 VAC) line voltage is applied through primary fuse F1 and the power on-off switch (remote SB-104 switch) to the primary winding of power transformer T1. From the secondary winding, the voltage is applied to BR1 — a full wave bridge rectifier circuit. The rectified DC is then filtered by electrolytic capacitors C1 and C2, and applied to the regulator circuitry.

Transistors Q1 and Q2, with Q3 and Q4 form a triple Darlington circuit with exceptionally high gain for good regulation. Transistors Q3 and Q4 are paralleled in a series regulator circuit. The conduction of the Darlington circuit and the output voltage is controlled by the base bias provided by integrated circuit IC1. IC1 with its own zener reference diode, samples the output voltage, compares this to the internal reference voltage, and automatically adjusts the base bias of Q1 as needed to maintain a fixed output level. The output voltage is sampled at the load end of the

power cable, thereby compensating for the voltage drop across fuse F2 and the power cable. This allows almost no change in load voltage from no load to full load conditions.

The regulated output voltage level is adjusted by VOLTAGE ADJUST control R6.

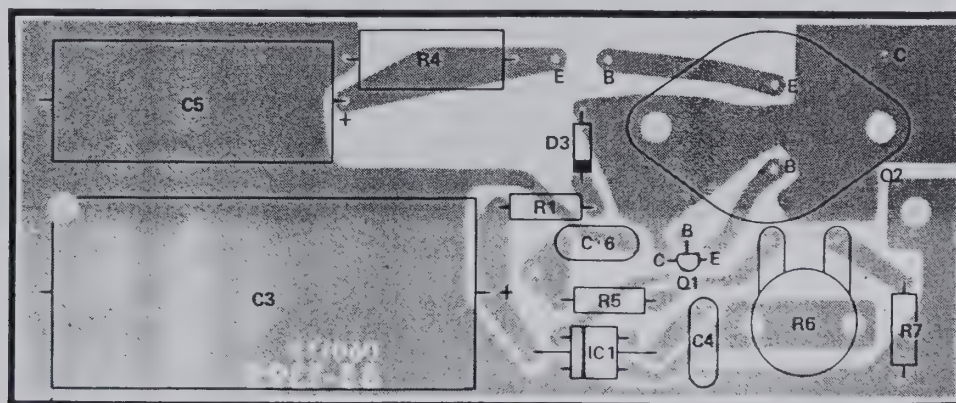
Capacitor C3 provides a nearly pure DC voltage for the integrated circuit regulator, IC1. Diode D5 allows C3 to charge from the power path but does not allow it to discharge back. In this way only the small load of IC1 is placed on C3. R1 prevents excessive current from flowing through D5 when the power supply is turned on.

Resistors R2 and R3 balance the current between the two regulator transistors, Q3 and Q4. Fuse F2 protects the regulators against an overload, and resistor R4 is a bleeder resistor and capacitor C5 provides transient protection for the supply.

## CIRCUIT BOARD X-RAY VIEW

NOTE: To find the PART NUMBER of a component for the purpose of ordering a replacement part:

- Find the circuit component number (R5, C3, etc.) on the "X-Ray View" or "Chassis Photograph."
- Locate this same number in the "Circuit Component Number" column of the "Parts List."
- Adjacent to the circuit component number, you will find the PART NUMBER and DESCRIPTION which must be supplied when you order a replacement part.

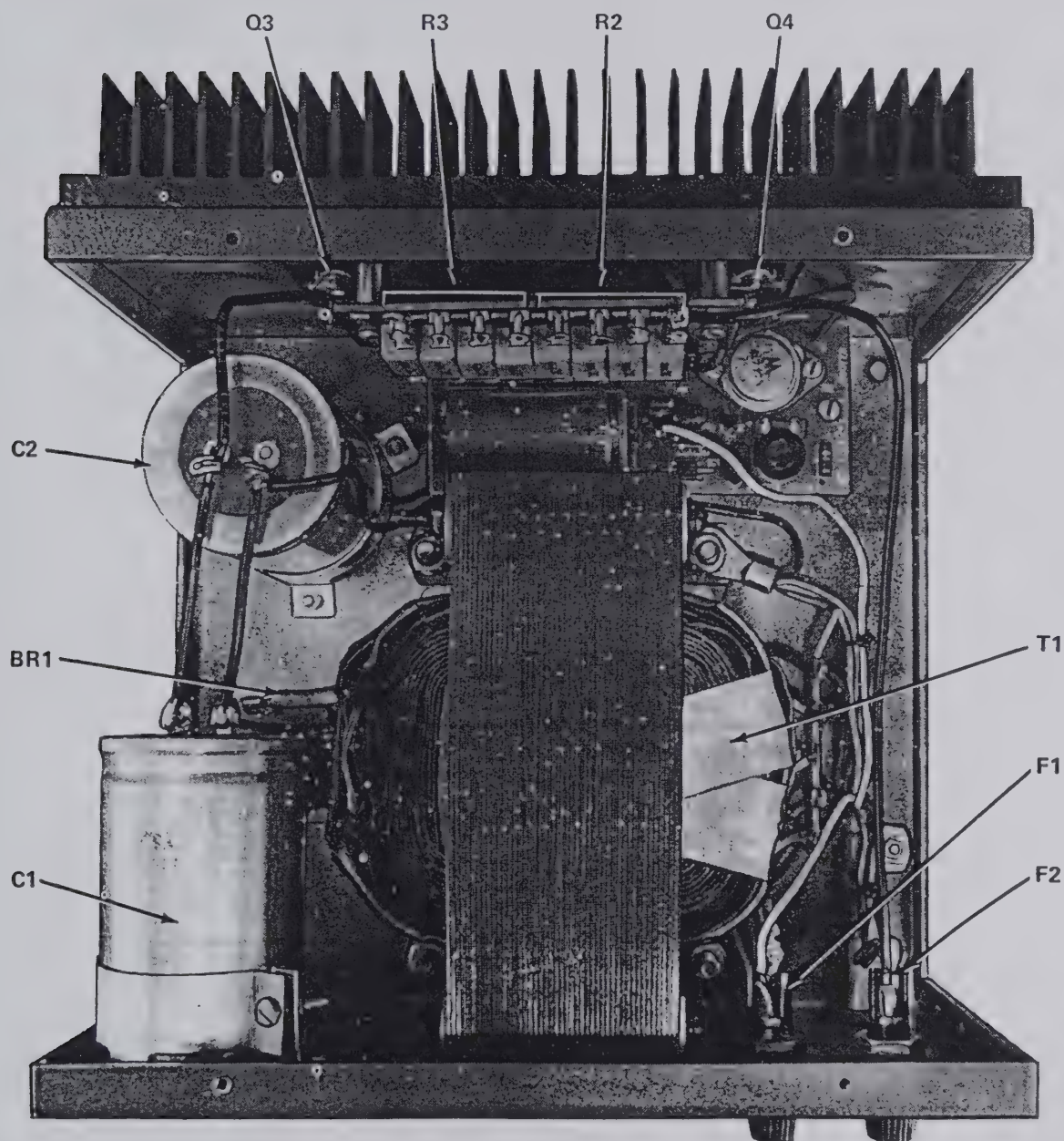


(Viewed from component side)



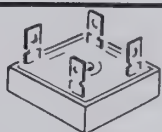
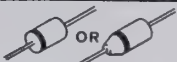
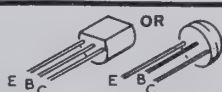

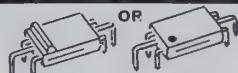


# CHASSIS PHOTOGRAPH





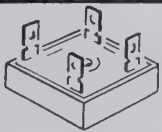
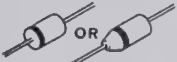
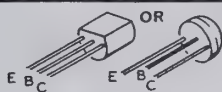
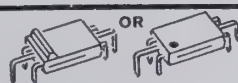
# SEMICONDUCTOR IDENTIFICATION CHART

COMPONENT NUMBER	HEATH PART NUMBER	REPLACED BY	DESCRIPTION
BR1	57-88	MDA990-2	BRIDGE RECTIFIER 
D5	57-65	1N4002	DIODE 
Q1	417-233	2N3643	TRANSISTOR 
Q2	417-215	2N3055	TRANSISTOR
Q3	417-139	40411	TRANSISTOR
Q4	417-139	40411	TRANSISTOR 
IC1	442-48	MFC6030	INTEGRATED CIRCUIT 





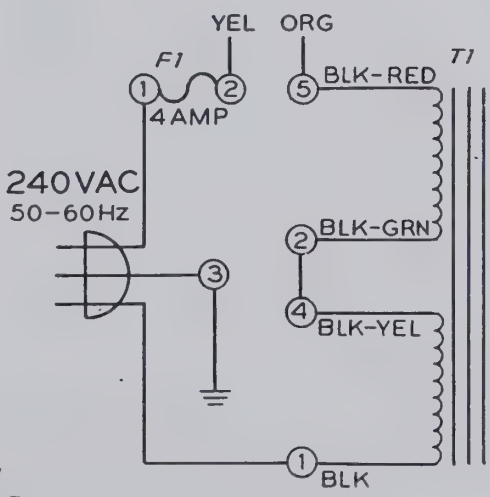
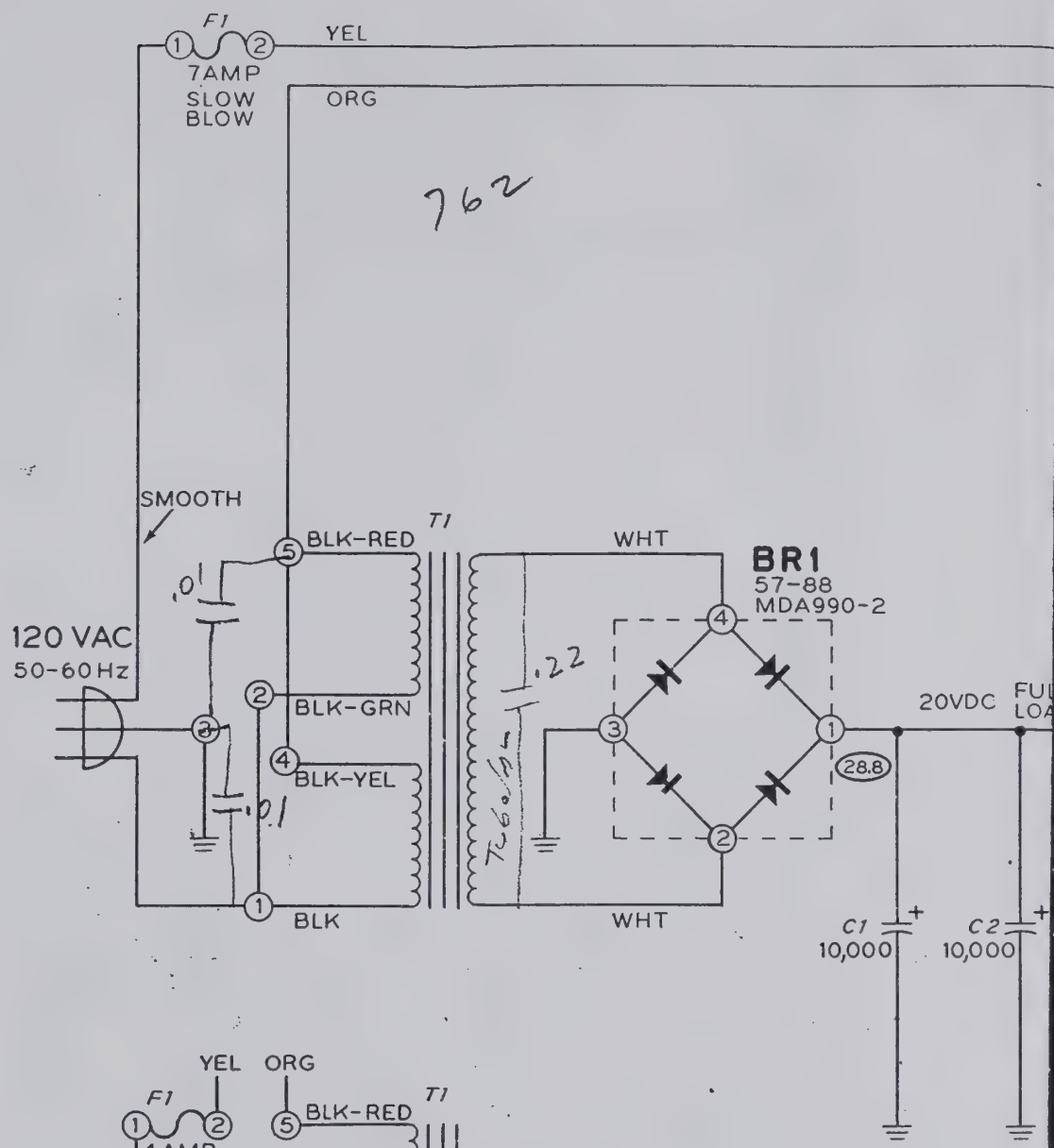
# SEMICONDUCTOR IDENTIFICATION CHART

COMPONENT NUMBER	HEATH PART NUMBER	REPLACED BY	DESCRIPTION
BR1	57-88	MDA990-2	BRIDGE RECTIFIER 
D5	57-65	1N4002	DIODE 
Q1	417-233	2N3643	TRANSISTOR 
Q2	417-215	2N3055	TRANSISTOR
Q3	417-139	40411	TRANSISTOR
Q4	417-139	40411	TRANSISTOR
IC1	442-48	MFC6030	INTEGRATED CIRCUIT 





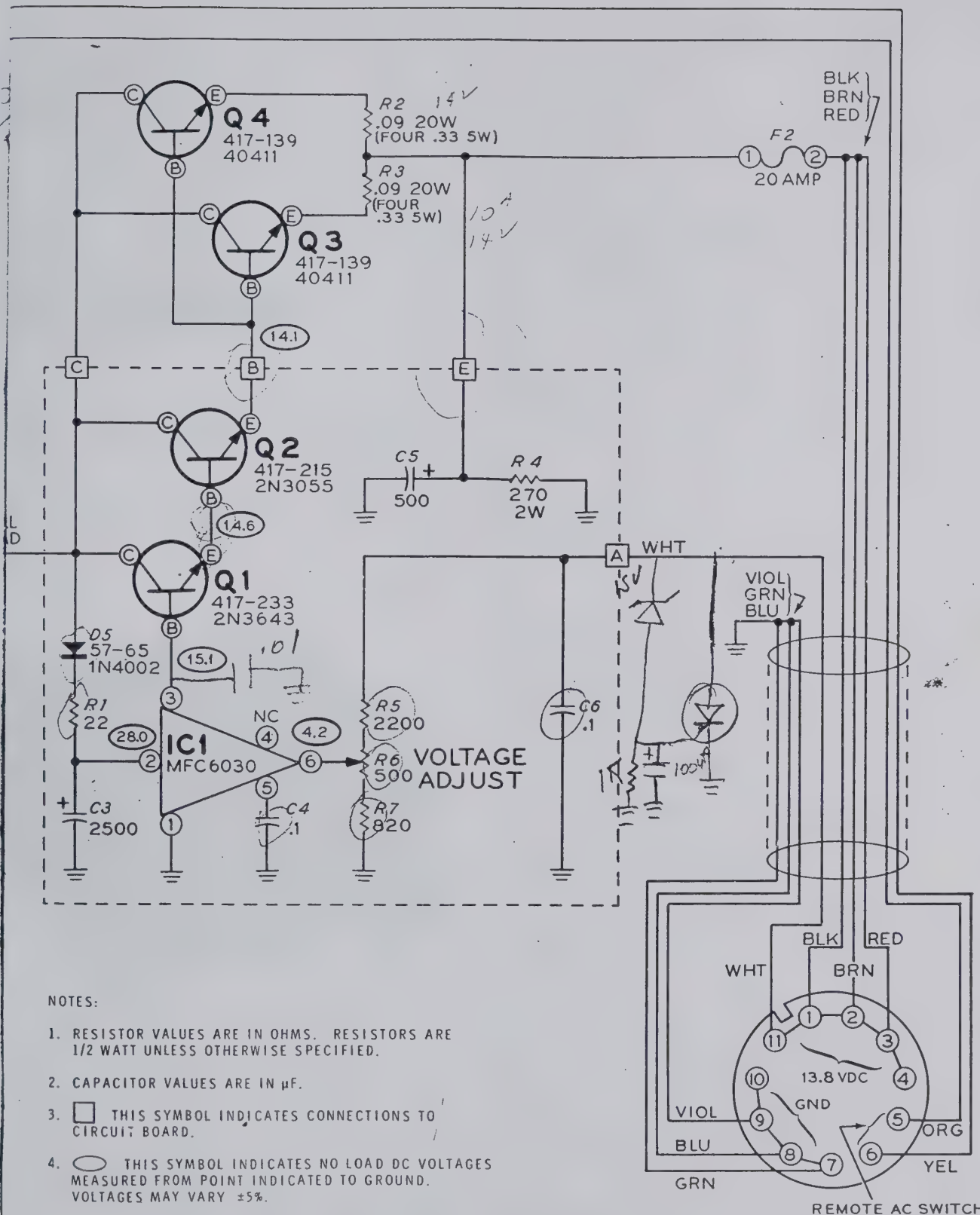
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SCHEMATIC OF THE  
HEATHKIT®  
AC POWER SUPPLY  
MODEL HP-1144

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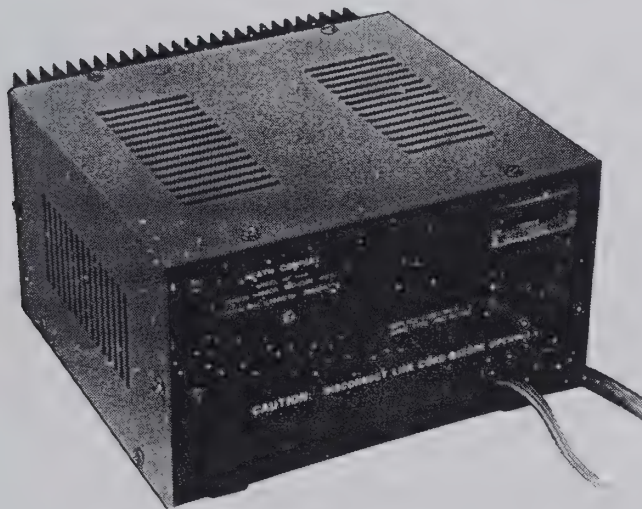


# Assembly and Operation of the



## AC POWER SUPPLY

MODEL HP-1144



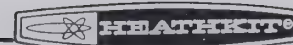
### TABLE OF CONTENTS

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HEATH COMPANY  
BENTON HARBOR, MICHIGAN 49022







## INTRODUCTION

The Heathkit Model HP-1144 AC Power Supply provides well-regulated, low voltage, DC power from an AC power source. You can wire it to operate from either a 120-volt AC or 240-volt AC 50/60 Hz power line and maintain regulation within 2%.

This AC Power Supply was primarily designed to provide +13.8 VDC for the Heathkit, Model SB-104 SSB Transceiver. A cable and socket provide output power and a series connection for the remote on-off switch on the Transceiver.

The attractive, rugged construction and reliable performance of this Power Supply will provide many years of dependable service.

Refer to the "Kit Builders Guide" for complete information on unpacking, parts identification, tools, wiring, soldering, and step-by-step assembly procedures.

## PARTS LIST

Check each part against the following list. The parts may vary slightly from the illustration. Keep any part that is individually packaged with a part number on it in its package after you identify it until you actually use it. Some parts are marked with a "171-" packaging number. These numbers are used for packaging only and do not appear in the Manual "Parts List." Save all packaging material until you locate all the parts.

Each circuit part in this kit has its own circuit component number (R2, C4, etc.). Use these numbers when you want to positively identify the same part in the various sections of the Manual. These numbers, which are especially useful when a part has to be replaced, appear:

- In the Parts List,
- At the beginning of each step where a component is installed,
- In some illustrations,
- In the Schematic,
- In the sections at the rear of the Manual.

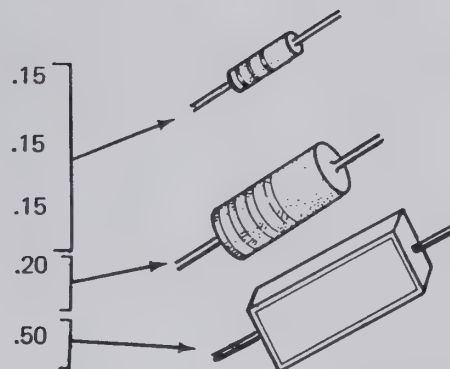
To order a replacement part use the Parts Order Form furnished with this kit. If a Parts Order Form is not available, refer to "Replacement Parts" inside the rear cover of this Manual. NOTE: Never use a "171-" packaging number if you must order replacement parts; use only the part numbers listed in the following list.



QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.	PRICE Each
------	-------------	-------------	--------------------------	---------------

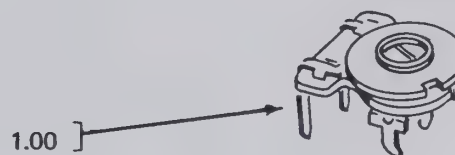
## RESISTORS

( )	1	22 $\Omega$ (red-red-black), 1/2-watt	1-49	R1	.15
( )	1	820 $\Omega$ (gray-red-brown), 1/2-watt	1-8	R7	.15
( )	1	2200 $\Omega$ (red-red-red), 1/2-watt	1-44	R5	.15
( )	1	270 $\Omega$ (red-violet-brown), 2-watt	1-30-2	R4	.20
( )	8	.33 $\Omega$ , 5-watt	3-11-5	R2, R3 (4 each)	.50



## CONTROL

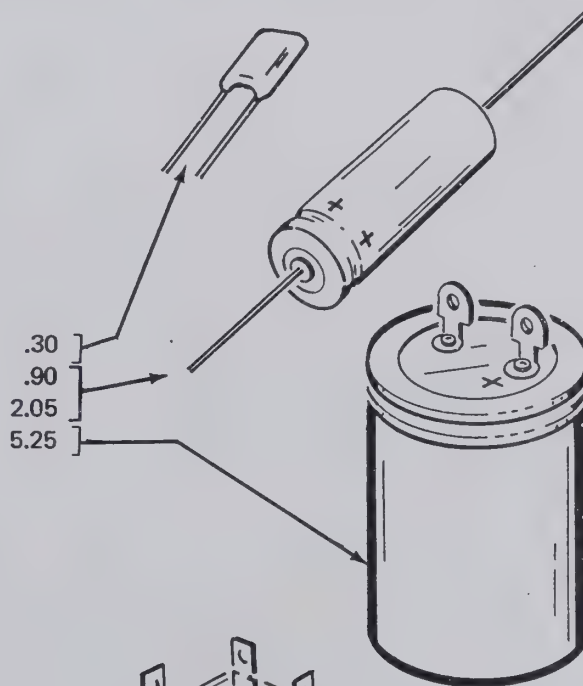
( )	1	500 $\Omega$	10-381	R6	1.00
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## CAPACITORS

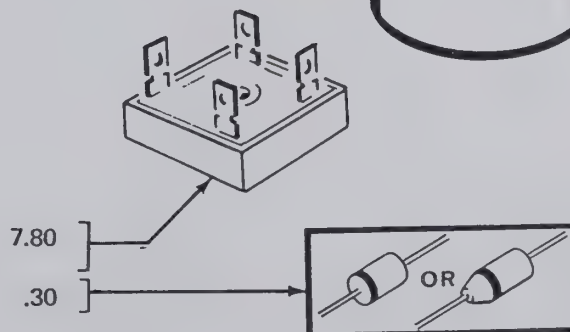
NOTE: Mylar capacitors can be marked three different ways. EXAMPLE: .1, .1k, or .1  $\mu$ F. However, the parts list and installation instructions will always use  $\mu$ F.

( )	2	.1 $\mu$ F Mylar*	27-47	C4, C6	.30
( )	1	500 $\mu$ F electrolytic	25-199	C5	.90
( )	1	2500 $\mu$ F electrolytic	25-154	C3	2.05
( )	2	10,000 $\mu$ F electrolytic	25-263	C1, C2	5.25



## DIODES-TRANSISTORS

( )	1	MDA990-2 bridge rectifier	57-88	BR1	7.80
( )	1	1N4002 diode	57-65	D5	.30



\*DuPont Registered Trademark





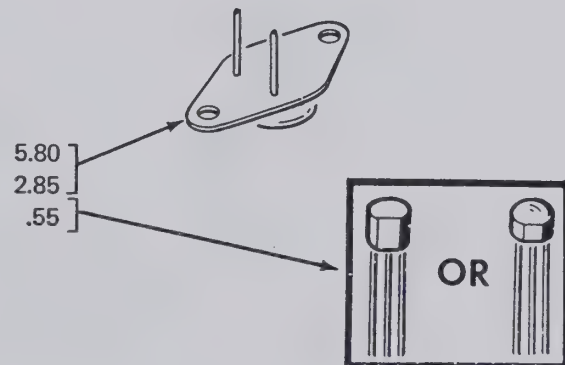
QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.	PRICE Each
------	-------------	-------------	--------------------------	---------------

### Diodes-Transistors (cont'd.)

NOTE: Transistors are marked for identification in one of the following four ways. (The term "type number" refers only to the numbers in a transistor or integrated circuit description. It does not refer to the letters, which could change.)

1. Part number.
2. Transistor or integrated circuit type number.
3. Part number and type number.
4. Part number with a type other than the one listed.

( )	2	40411 transistor	417-139	Q3, Q4
( )	1	2N3055 transistor	417-215	Q2
( )	1	2N3643 transistor	417-233	Q1



### INTEGRATED CIRCUIT

NOTE: If either the "Part Number" or the "Description" number is on the integrated circuit, you have the correct part. Do not be concerned about any other numbers. (The Description number may have additional letters and numbers other than those given.)

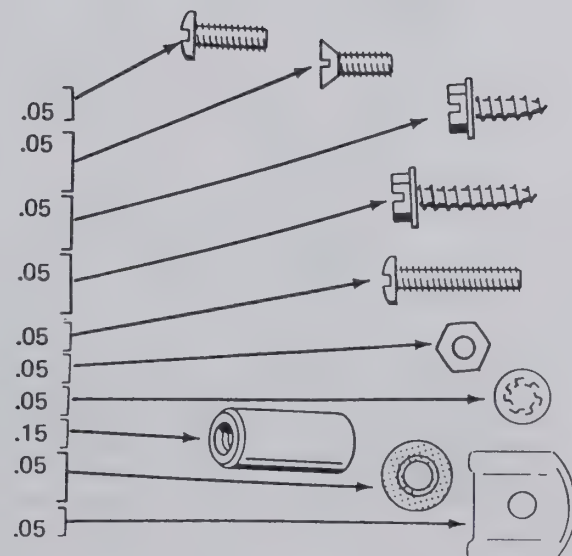
( )	1	MFC 6030 integrated circuit	442-48	IC1
-----	---	-----------------------------	--------	-----



### HARDWARE

#### #6 Hardware

( )	16	6-32 x 3/8" screw	250-89
( )	2	6-32 x 3/8" flat head screw	250-434
( )	12	#6 x 3/8" sheet metal screw	250-475
( )	4	#6 x 5/8" sheet metal screw	250-1199
( )	7	6-32 x 11/16" screw	250-206
( )	13	6-32 nut	252-3
( )	22	#6 lockwasher	254-1
( )	4	6-32 x 11/16" spacer	255-83
( )	6	#6 fiber shoulder washer	253-2
( )	1	#6 D washer	253-89







QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.	PRICE Each
------	-------------	-------------	--------------------------	---------------

### Hardware (cont'd.)

#### 1/4" Hardware

( )	8	1/4"-20 x 7/8" screw	250-253	
( )	13	1/4" nut	252-57	
( )	9	1/4" flat washer	253-31	
( )	14	1/4" lockwasher	254-14	
( )	1	Large solder lug	259-23	

### METAL PARTS

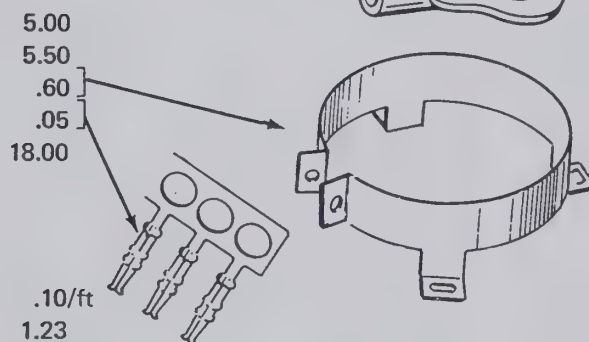
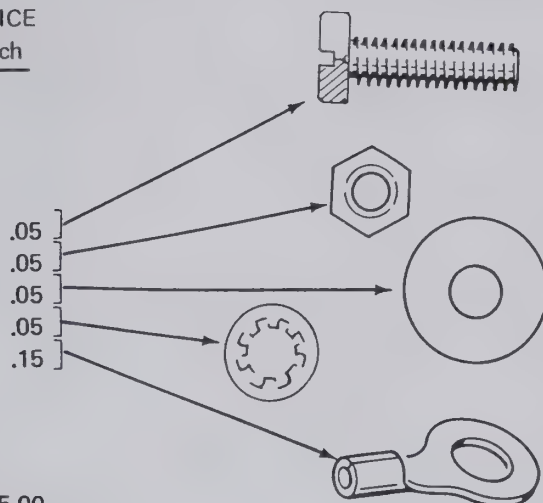
( )	1	Cover	90-1108-1	
( )	1	Chassis	200-678-1	
( )	2	Clamp	207-2	
( )	1	Connector pin	259-20	
( )	1	Heat sink	215-76	

### WIRE-SLEEVE

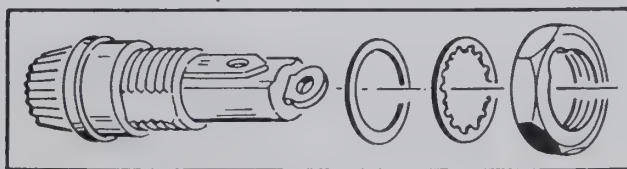
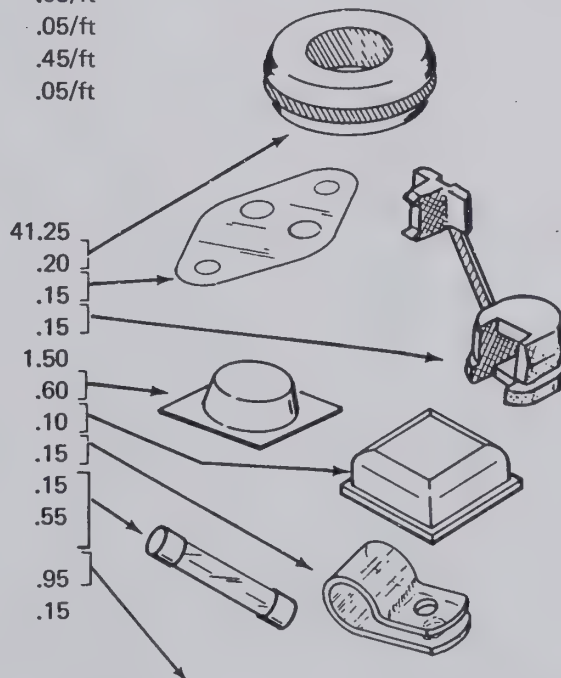
( )	1	Large sleeving	346-4	
( )	1	Line cord	89-23	
( )	1	Brown wire #18	344-31	
( )	1	Small sleeving	346-7	
( )	1	Cable (9 wire)	347-40	
( )	1	Bare wire	340-1	

### MISCELLANEOUS

( )	1	Transformer	54-848	T1
( )	1	Grommet	73-23	
( )	2	Mica insulator	75-44	
( )	1	Strain relief	75-71	
( )	1	Printed circuit board	85-1392-1	
( )	1	Thermal grease	352-31	
( )	4	Plastic foot	261-34	
( )	1	Cable clamp	207-18	
( )	1	20-amp fuse, 3AG, SFE	421-18	F2
( )	1	7-amp fuse, 3AG, MDX7 slow-blow	421-9	F1
( )	2	Fuseholder	423-1	
( )	1	Nut starter	490-5	



.10/ft  
1.23  
.05/ft  
.05/ft  
.45/ft  
.05/ft





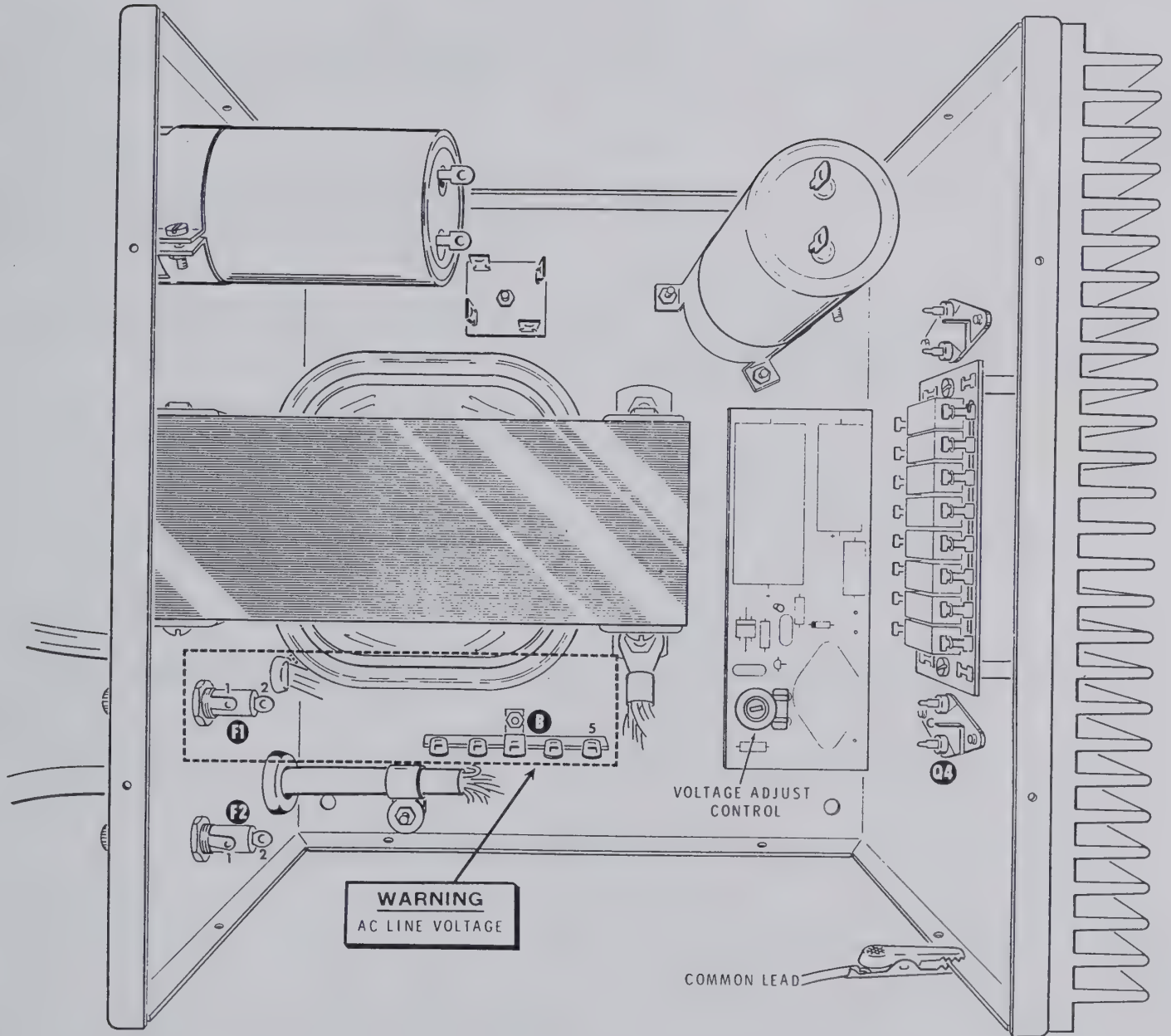


Figure 1





## TEST AND ADJUSTMENT

In the following steps, if you do not obtain the desired results, refer to the "In Case of Difficulty" section and correct the problem before you proceed.

### Resistance Checks

If you have a VOM (or VTVM) available, make the following resistance checks before you plug the line cord into an AC outlet.

- ( ) Connect the common or ground lead of your meter to the Power Supply chassis. Retain this connection for the following "Test and Adjustment" steps.
- ( ) Touch lug C of transistor Q4 with the other meter lead. Be sure a high resistance is indicated between lug C and the chassis.
- ( ) Connect the other meter lead to fuseholder F2 lug 2. You should get a reading of approximately 3000 ohms on RX100 range. Retain this connection for the following step.
- ( ) F2: Install a 20-ampere fuse in fuseholder F2. You should get a reading of approximately 250 ohms.

### Voltage Adjustment

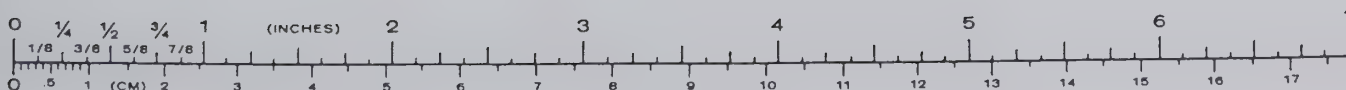
- ( ) Prepare a 5" brown wire.

- ( ) Temporarily solder this wire between fuseholder F1 lug 1 and terminal strip B lug 5.
- ( ) Adjust the VOM to measure DC voltages in the 15-volt range.
- ( ) Connect the positive lead of the VOM to fuseholder F2 lug 2.

**CAUTION:** When the line cord is connected to an AC outlet, AC voltage will be present at several places on the chassis, as shown in Figure 1. Be careful you do not contact this voltage because an electrical shock will result.

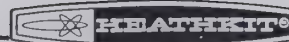
- ( ) Plug the line cord into a proper AC outlet. The output should measure between 11 and 15 VDC.
- ( ) Turn the Voltage Adjust control on the circuit board until the meter indicates +13.8 volts DC.
- ( ) UNPLUG THE LINE CORD.
- ( ) Remove the temporary wire from between fuseholder F1, lug 1 and terminal strip B lug 5.

This completes the "Test and Adjustment" section of the Manual. Proceed to "Final Assembly."









## OPERATION

The output voltage can be adjusted between approximately 11 and 16 volts DC, as noted in the "Specifications" section. The recommended value for use with the SB-104 Transceiver is 13.8 volts DC. The operation of the AC Power Supply

consists only of connecting the power cable to the SB-104 and the line cord to the proper AC line. The Power Supply will be switched remotely by the SB-104 switch.

## IN CASE OF DIFFICULTY

**CAUTION:** When the line cord is connected to an AC outlet, AC voltage will be present at several places on the chassis. Be careful you do not contact this voltage or an electrical shock can result

1. Recheck the wiring. Trace each lead in color pencil on the Pictorial as it is checked. It is frequently helpful to have a friend check your work. Someone who is not familiar with the unit may notice something you have consistently overlooked.
2. About 90% of the kits that are returned for repair do not function properly due to poor connections and soldering. Therefore, many troubles can be eliminated by a careful inspection of connections to make sure they are soldered as described in the "Soldering" section of the "Kit Builders Guide." Reheat any doubtful connections. Be sure all the wires are soldered at places where several wires are connected.
3. Be sure the transistors and the integrated circuit are in the proper locations (correct part number and type number). Be sure that each transistor lead is in the right hole and has a good solder connection. Check the integrated circuit for proper positioning and for good contact at each pin connection.
4. Check capacitor values carefully. Be sure the proper part is wired into the circuit at each capacitor location. Check each electrolytic capacitor to be sure the lead near the positive (+) marking is at the correct position.
5. Check each resistor value carefully.
6. Be sure the correct diode is installed and that the banded end is positioned correctly.
7. Check all component leads connected to the circuit board.
8. Make sure bare wires do not touch the chassis or other lugs and make sure all wires are properly soldered.



## Troubleshooting Chart

PROBLEM	PROBABLE CAUSE
No output voltage.	<ol style="list-style-type: none"><li>1. F1.</li><li>2. F2.</li></ol>
Primary fuse F1 blows.	<ol style="list-style-type: none"><li>1. Bridge rectifier BR1 assembly.</li><li>2. Capacitor C1, C2.</li></ol>
Output fuse F2 blows.	<ol style="list-style-type: none"><li>1. Excessive loading (keydown).</li><li>2. Output shorted.</li></ol>
Unable to obtain +13.8 VDC with Voltage Adjust control.	<ol style="list-style-type: none"><li>1. IC1.</li><li>2. Voltage Adjust control R6.</li><li>3. Resistors R5 or R7.</li><li>4. D5.</li></ol>
Voltage drops significantly when transmitting.	<ol style="list-style-type: none"><li>1. IC1.</li><li>2. Q1, Q2, Q3, or Q4.</li></ol>

In an extreme case where you are unable to resolve a difficulty, refer to the "Customer Service" information inside the rear cover of the Manual. Your Warranty is located inside the front cover.







## SPECIFICATIONS

Output Voltage . . . . .	13.8 VDC regulated. (Adjustable from approximately 11 to 16 VDC.)
Maximum Output Current . . . . .	20 amperes, intermittent, 8 amperes continuous.
Transistor Integrated Circuit and Diode Complement . . . . .	2N3643 transistor. 2N3055 transistor. 40411 pass transistor (2). MFC6030 regulator IC. 1N4002 silicon diode. MDA990-2 bridge rectifier.
Power Requirements . . . . .	110 to 130 VAC, 6 amperes; or 220 to 260 VAC, 3 amperes, 50/60 Hz maximum.
Dimensions . . . . .	5-1/2" high x 9-1/4" wide x 10-1/4" deep.
Regulation . . . . .	Less than 2% from no load to 20 amperes.
Ripple . . . . .	Less than 1% at 20 amperes.
Fuses . . . . .	7-amp, 3AG, slow-blow primary. 20-amp, 3AG, output.
Net Weight . . . . .	23 lbs. (10.4Kg).

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The Heath Company reserves the right to discontinue products and to change specifications at any time without incurring any obligation to incorporate new features in products previously sold.



## CIRCUIT DESCRIPTION

Refer to the Schematic Diagram (fold-out from Page 31) as you read the following description.

The 120 VAC (or 240 VAC) line voltage is applied through primary fuse F1 and the power on-off switch (remote SB-104 switch) to the primary winding of power transformer T1. From the secondary winding, the voltage is applied to BR1 — a full wave bridge rectifier circuit. The rectified DC is then filtered by electrolytic capacitors C1 and C2, and applied to the regulator circuitry.

Transistors Q1 and Q2, with Q3 and Q4 form a triple Darlington circuit with exceptionally high gain for good regulation. Transistors Q3 and Q4 are paralleled in a series regulator circuit. The conduction of the Darlington circuit and the output voltage is controlled by the base bias provided by integrated circuit IC1. IC1 with its own zener reference diode, samples the output voltage, compares this to the internal reference voltage, and automatically adjusts the base bias of Q1 as needed to maintain a fixed output level. The output voltage is sampled at the load end of the

power cable, thereby compensating for the voltage drop across fuse F2 and the power cable. This allows almost no change in load voltage from no load to full load conditions.

The regulated output voltage level is adjusted by VOLTAGE ADJUST control R6.

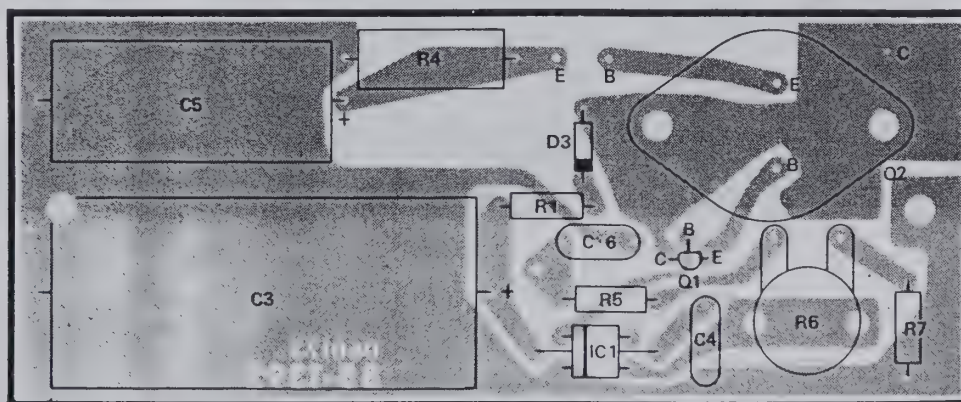
Capacitor C3 provides a nearly pure DC voltage for the integrated circuit regulator, IC1. Diode D5 allows C3 to charge from the power path but does not allow it to discharge back. In this way only the small load of IC1 is placed on C3. R1 prevents excessive current from flowing through D5 when the power supply is turned on.

Resistors R2 and R3 balance the current between the two regulator transistors, Q3 and Q4. Fuse F2 protects the regulators against an overload, and resistor R4 is a bleeder resistor and capacitor C5 provides transient protection for the supply.

## CIRCUIT BOARD X-RAY VIEW

NOTE: To find the PART NUMBER of a component for the purpose of ordering a replacement part:

- Find the circuit component number (R5, C3, etc.) on the "X-Ray View" or "Chassis Photograph."
- Locate this same number in the "Circuit Component Number" column of the "Parts List."
- Adjacent to the circuit component number, you will find the PART NUMBER and DESCRIPTION which must be supplied when you order a replacement part.

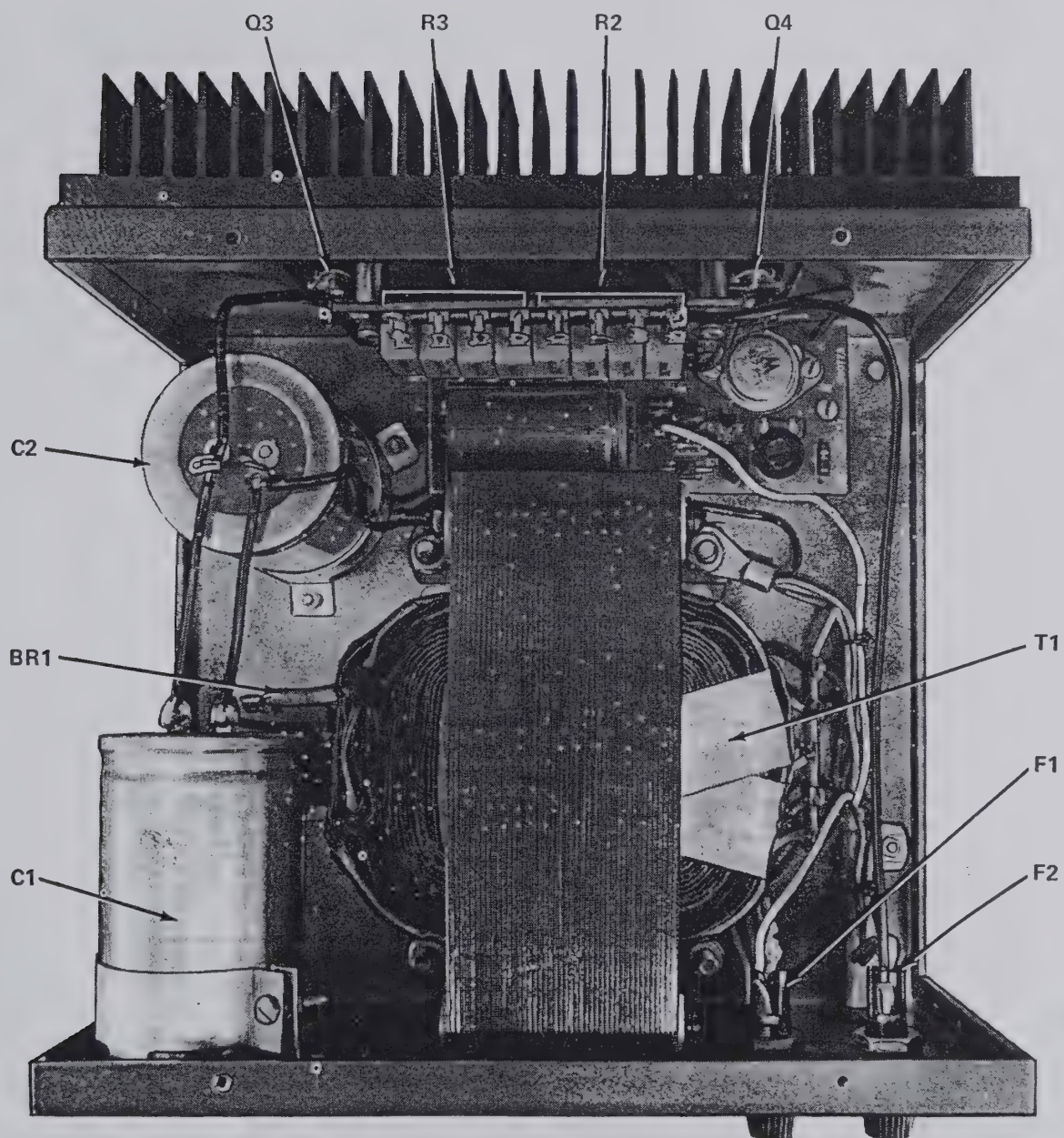


(Viewed from component side)



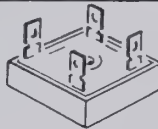
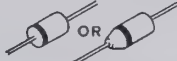
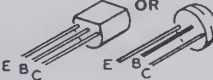



## CHASSIS PHOTOGRAPH





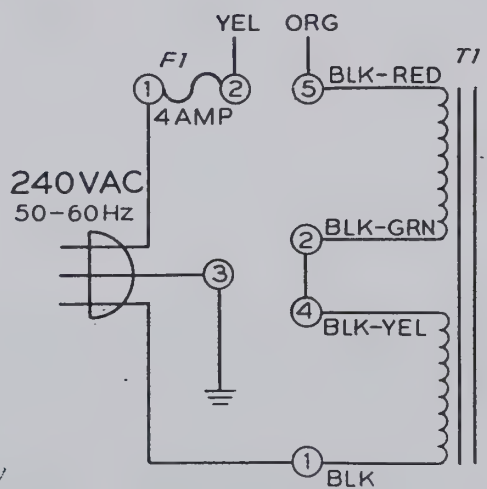
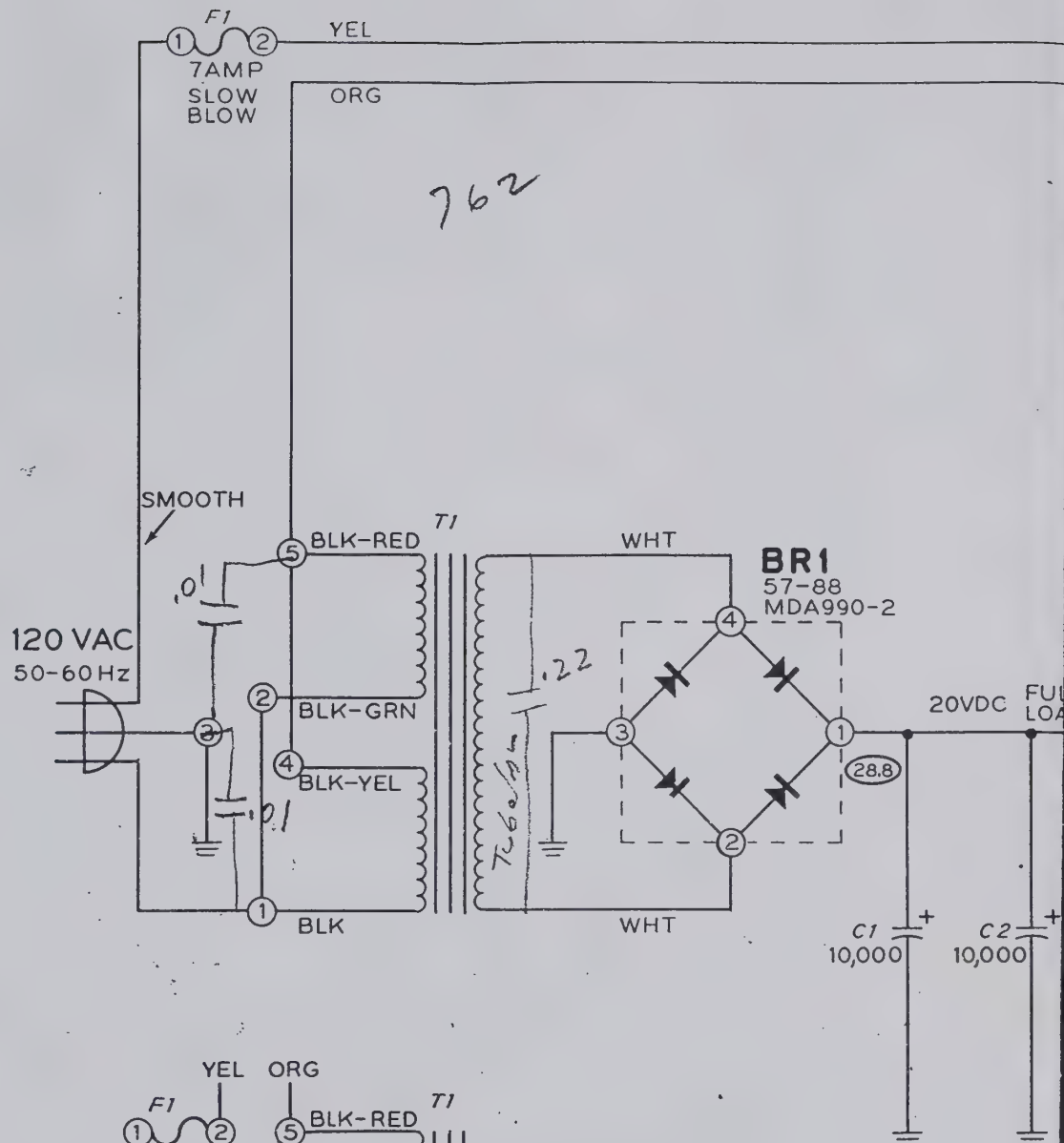
# SEMICONDUCTOR IDENTIFICATION CHART

COMPONENT NUMBER	HEATH PART NUMBER	REPLACED BY	DESCRIPTION
BR1	57-88	MDA990-2	BRIDGE RECTIFIER 
D5	57-65	1N4002	DIODE 
Q1	417-233	2N3643	TRANSISTOR 
Q2	417-215	2N3055	TRANSISTOR
Q3	417-139	40411	TRANSISTOR
Q4	417-139	40411	TRANSISTOR
IC1	442-48	MFC6030	INTEGRATED CIRCUIT 





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SCHEMATIC OF THE  
HEATHKIT®  
AC POWER SUPPLY  
MODEL HP-1144

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